

ALASKA DEPARTMENT OF FISH AND GAME  
DIVISION OF COMMERCIAL FISHERIES

ANNUAL MANAGEMENT REPORT

1977

PRINCE WILLIAM SOUND AREA  
REGION II

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## PREFACE

This is the eighteenth annual management report prepared since the State assumed control of the fisheries from the Federal Government in 1960. The 1977 data is preliminary and will be finalized and corrected in subsequent reports. Data presented here supersedes information presented in previous management reports.

The report presents a brief description of the 1977 fishery and summarizes recent historical catch, escapement and related data on each species harvested by the commercial fishery.

The report is compiled primarily for use as a reference source for management purposes. Persons desiring additional information should direct a specific request to the area office in Cordova.

## ACKNOWLEDGEMENTS

The Commercial Fisheries Division, Prince William Sound Area, employed 10 permanent employees, and 21 seasonal employees in 1977 who participated in various area management programs.

Thanks is extended to all personnel for a successful 1977 fisheries season.

Special acknowledgement is given to Peter J. Fridgen and Michael McCurdy for their contribution in preparation of the contents of this report. Also, to Jeannette Bailey for editorial comments and the task of typing and collating the 1977 report.

Following is a list of personnel, general duty assignments and dates of employment.

### Permanent Employees

Ralph B. Pirtle	Area Management Biologist
Peter J. Fridgen	Assistant Area Management Biologist
Michael McCurdy	Research Biologist, Project Leader
Al Kimker	Research Biologist, Project Leader
Kenneth Roberson	Research Biologist, Project Leader
Frank Bird	Fishery Biologist
John M. Jackson	Fisheries Technician V
Jeannette Bailey	Clerk - Stenographer
Janice Shaw	Clerk Typist
Kathy Adler	Clerk Typist

### Seasonal Employees

George V. Addington	Tanner Crab Tagging Program	5/16 - 9/30
	Eshamy Weir Station	
Lawrence Boyle	Coghill River Weir Station	6/ 1 - 8/30
Mark Chihuly	* Lake Surveys, Incubation System	5/ 9 - 9/30
Karen Crandall	* Field Surveys, Glennallen Office	1/17 - 6/27
Janelle Eklund	* Lake Surveys, Scale Reading	7/18 - 12/ 2
Tom Henderson	Coghill River Weir Station	6/ 1 - 8/ 5
Russell Holder	* Incubation System	6/ 8 - 9/15
Ruth Ivey	* Subsistence Fishery - Chitina	5/31 - 8/15
P. J. James	Fish Ticket Editor	2/16 - 10/14
Harley King	* Long Lake Weir Station	8/16 - 9/30
Ward Knous	Fry Dig	3/ 7 - 3/18
Robert Levis	* Tokun Lake Weir Station	5/24 - 8/12
Mark Miller	Herring and Tanner Crab Research	4/16 - 9/30
	Eshamy Weir Station	
Robert O'Hare	* Incubation System	9/ 1 - 10/28
Margery Osborne	* Incubation System	5/ 6 - 10/28
Alison Rabich	* Subsistence Fishery - Chitina	5/31 - 8/15

Seasonal Employees, cont.

Debra Roberts	Crab, Herring, Clam, Salmon Sampling	2/ 2 - 9/15 12/16 - 12/31
Dale Russell	* Martin Lake Weir Station	5/ 9 - 8/19
Tim Siegert	* Subsistence Fishery - Chitina	5/31 - 8/15
Chris Sundby	* Martin Lake Weir Station,	5/23 - 8/18
Johnathan Wright	* Fish Sample Examination	7/19 - 8/12

\* Projects under the supervision of Kenneth Roberson.

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## INTRODUCTION

The Prince William Sound Commercial Fisheries Management Area is located in the northcentral Gulf of Alaska, and comprises all of the drainages in Alaska from Cape Suckling on the east to Cape Fairfield on the west. This area encompasses the water of Controller Bay, Copper River, Prince William Sound and several small rivers and streams entering the Copper River Delta and Gulf of Alaska. In land area, the Prince William Sound Commercial Fisheries Management Area includes approximately 38,000 square miles, most of which is drained by the Copper River entering the Gulf of Alaska east of Prince William Sound (Figure 1).

### SALMON

The Prince William Sound Management Area is divided into eleven salmon management districts (Figure 1) and five salmon management subdistricts which conform to geographical and biological distribution of the salmon species harvested.

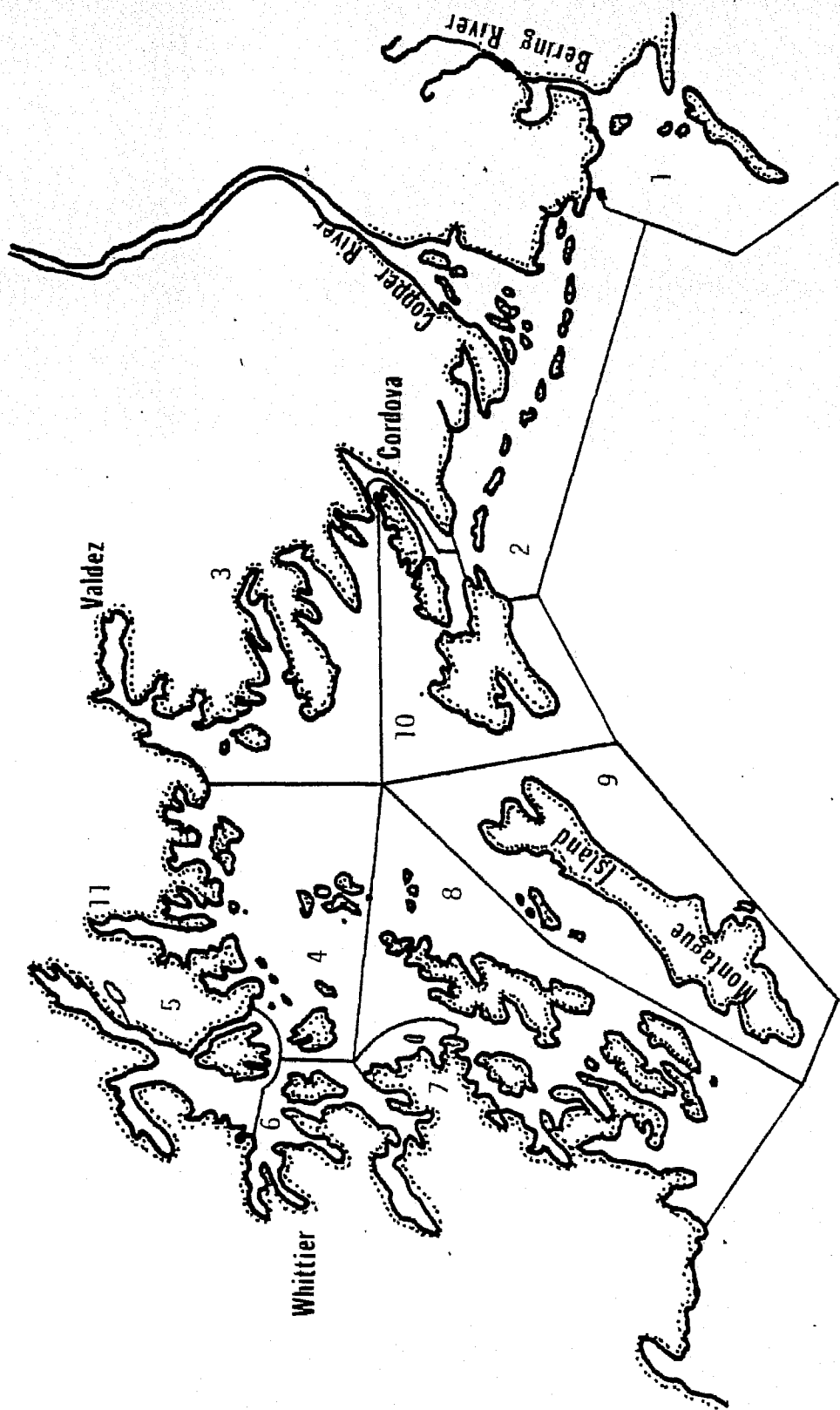
Bering River district includes all the water between Cape Martin on the west and Cape Suckling on the east including Controller Bay and Katalla Bay. This small drift gill net salmon fishery harvests about one percent of the Area's sockeye catch and about 25 percent of the coho catch. Small incidental catches of king, pink and chum salmon are taken during each season and amount to less than one percent of the district catch. During the peak of the 1977 spring fishery 52 units of gear were fished, and 29 during the coho fishery.

Copper River district includes all the water between Cape Martin on the east and Hook Point, Hinchinbrook Island on the west, and is separated from Prince William Sound's Eastern district by a boundary line from Boswell Rock, Hinchinbrook Island to the radio tower at Whitshed Village on the mainland shore southwest of Cordova. The Copper River district supports the major drift gill net salmon fishery of the area, and harvests all five species of salmon although the target species of the district are sockeye during the spring and summer fishery, and coho in the fall. The district fishery harvests about 97 percent of the Area's king salmon catch, 65 percent of the sockeye, 72 percent of the coho and incidental amounts of pink and chum salmon. During the peak of the spring sockeye fishery 449 units of drift gill net gear was fished, 48 during the summer period and 194 during the coho fishery.

The Unakwik district is located in the northcentral part of Prince William Sound and includes the water of northern Unakwik Inlet, north of 61° 01' N. lat. The district was established to harvest small runs of sockeye salmon returning to Cowpen Lake and Miner's Lake systems. Usually less than 10,000 sockeye are taken each year. In 1977 the district sockeye catch of 7,912 represented less than one percent of the Area's sockeye catch.

The Unakwik season coincides with the Coghill district season and gear. Both purse seine and drift gill net gear is fished from June 18 until the end of the general season. In 1977, during the peak of the season 16 units of drift gill net gear were being fished.

Coghill district, located in northwestern Prince William Sound includes all of the water of Port Wells north of 60° 48' 30" N. lat., all the water within one nautical mile of the south shore of Esther Island. including



### Fishing Districts

- |                 |                  |
|-----------------|------------------|
| 1. Bering River | 6. Northwestern  |
| 2. Copper River | 7. Eshamy        |
| 3. Eastern      | 8. Southwestern  |
| 4. Northern     | 9. Montague      |
| 5. Coghill      | 10. Southeastern |
|                 | 11. Unakwik      |

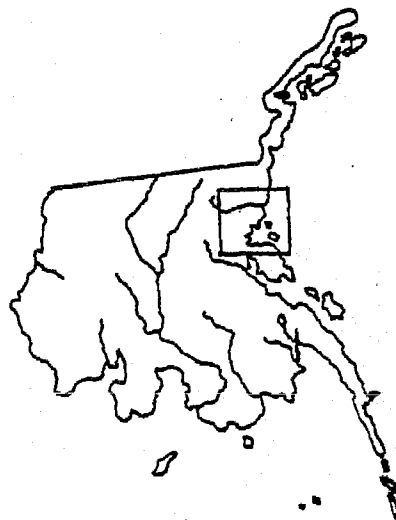


Figure 1. Prince William Sound Area commercial fisheries salmon management areas.



Esther Passage. (Prior to 1976 the western one-half of Port Wells was included in the Northwestern district).

Coghill district was established primarily to harvest the sockeye salmon returning to Coghill Lake; however, significant numbers of pinks and chums are taken, and the numbers of these species commonly exceed the sockeye catch. There is a tremendous variation in the numbers of odd and even year pinks returning to Coghill River. Spawning escapement estimates have ranged from 552,060 in 1975 to an even year average of about 9,000 pinks. The district catch by species in 1977 contributed about 18 percent of the Area's sockeye catch, 12 percent of the pink catch and about 29 percent of the chum catch. Small, incidental catches of kings and coho are taken each year.

Both purse seine and drift gill net gear are used in the district. In 1977, peak gear counts totaled 207 drift gill nets and 47 purse seines. When the Coghill district season begins on June 18 a large influx of gear moves into the district from the Copper River flats and consequently reduces the Copper River effort by almost one-half.

Eshamy district is located on the western central mainland shore of Prince William Sound. The district includes the water within one nautical mile of the mainland shore from the outer point on the north shore of Granite Bay, on the south end of the district, to the light on the south shore of the entrance to Port Nellie Juan, on the north end of the district.

The district was established to harvest a run of sockeye salmon returning to the Eshamy Lake system. The Eshamy district fishery catches all five species of salmon. Sockeye is the target species; however, substantial numbers of pinks and chums are intercepted which are primarily bound for other districts in the Sound. Small numbers of king and coho are caught in the district. In 1977 the district fishery produced about three percent of the Area's sockeye catch, two percent of the pink catch and two percent of the chum catch.

Both set and drift gill net gear are used in the Eshamy district with drift gear far outnumbering the set gear. In 1977 the peak gear totaled 53 drift gill nets and 12 set gill nets. Catches by drift gill nets in 1977 were about double those from set gill net gear.

The General Districts of Prince William Sound include the Eastern, Northern, Northwestern, Southwestern, Montague and Southeastern districts, which include the remainder of Prince William Sound. Purse seines are the legal gear, and the primary target species are pink and chum salmon. Forecasts of returning pinks and chums are made each year based on pre-emergent fry data, and purse seine seasons set accordingly. Season openings are usually published in the regulations, and season closures made by emergency order.

Purse seines normally harvest the majority of the pinks and chums of the Area's catch from the General districts. In 1977 the General districts produced about 11 percent of the sockeye, 85 percent of the pinks and 69 percent of the Area chum catch. Incidental and usually insignificant numbers of king and coho are also taken from the General districts.

In 1977 a total of 223 units of purse seine gear was fished.

## SHELLFISH

The management area for shellfish is the same as described for salmon. Each species of shellfish is managed on its own merits and separate management districts have been established for Tanner crab (Figure 2). No management districts have been described for other shellfish species, except that commercial taking of razor clams are from certain described certified beach areas for human consumption.

Four Tanner crab districts were established by regulation in 1977 as follows: Northern district, is generally the area of the northern one-half of Prince William Sound described by a line from the south entrance to Port Nellie Juan, to Point Eleanor (north tip of Knight Island group), to the eastern tip of Smith Island, to Johnstone Point, and north of a line from Point Bentinck to Point Whitshed; Hinchinbrook district, is generally the Hinchinbrook Entrance area of the Sound extending in a pie-shape to the east end of Smith Island described by a line from the eastern tip of Smith Island to Montague Point, from Zaikof Point to Seal Rocks, from Seal Rocks to Cape Hinchinbrook, and from Johnstone Point to the beginning at the eastern tip of Smith Island; Eastern district, is generally the gulf water from the longitude of Seal Rocks east to the longitude of Cape Suckling, water east of a line from Seal Rocks to Cape Hinchinbrook and water south of a line from Point Bentinck to Point Whitshed; and, Western district, is generally the southwest Sound and Gulf of Alaska west of the longitude of Seal Rocks and is described as all water east of the longitude of Cape Fairfield, south of a line from the southern entrance of Port Nellie Juan to Point Eleanor to the eastern tip of Smith Island to Montague Point, west of a line from Zaikof Point to Seal Rocks, and west of the longitude of Seal Rocks.

Tanner crab fishing is relatively new to the Prince William Sound Area, but has developed into the largest crab fishery within the short time since inception of the fishery in 1968. The fishery has spread throughout most of Prince William Sound and into the Gulf of Alaska south of Montague Island and eastward along the gulf to Cape St. Elias (Figure 2).

With the exception of the 1970-71 season the catch continued to increase each year reaching a high of about 14 million pounds in the 1972-73 season, and dropping rapidly to about 2.3 million pounds in the 1976-77 season, Table 1.

A guideline harvest level of 3.5 million pounds for the "Inside" area (Prince William Sound) and 12.0 million pounds "Outside" (Gulf) area, established in 1973, was never reached during the time the harvest level was in effect. In 1977 the guideline harvest level was changed to a more realistic level of 3 - 7 million pounds based on a sampling program initiated in 1976.

Prior to 1976 no size limit for male Tanners was in effect, and brood stock crab were being heavily exploited. In 1976 a minimum legal size of 5.3 inches was established to protect the breeding population. The reduced catch in the 1976-77 season is due in part to the enforcement of the minimum size limit.

Dungeness crab management areas, as such, have not been established, and the statistical area as described in the regulations has as its western boundary a line extending south from Cape Fairfield, and as its eastern boundary a line

extending south from Cape Suckling, and as its seaward boundary the 200 fathom depth contour. Two areas have been managed separately, however, and the area of Orca Inlet and Orca Bay, described in the Fishing Seasons section of the regulations, allows fishing from August 31 to June 1, with the remainder of Prince William Sound and the Gulf having no closed season. The two areas of historical catch have been Orca Bay/Orca Inlet and Copper River Flats/Controller Bay (Figure 3).

Orca Inlet, which is immediately adjacent to Cordova, provides a fishery that allows participation by small vessels in an area protected from adverse sea conditions. Crab fishermen can leave the harbor in the morning, pick their gear during the day, and deliver to the processor in the afternoon.

The Copper River Flats/Controller Bay area, although it is a summer and early fall fishery, is subject to more adverse sea conditions that requires larger vessels. Run time to and from this crabbing ground requires at least one day, not including fishing time.

The Dungeness crab fishery is strongly influenced by West Coast market conditions, therefore, historical catch statistics are not always reliable indicators of stock status.

In Orca Inlet the catch has decreased steadily from a level in excess of one million pounds in 1965 to the 1975 level of 165,000 pounds, (Figure 4). Factors responsible for the declining catch are not known, but environmental changes caused by the 1964 earthquake which raised the area about six feet, and food availability may have changed when local processors complied with environmental standards in disposing of crab and salmon wastes are both suspects.

Until 1969, catch records from Copper River/Controller Bay have included catches from the Icy Bay area which is not in the Prince William Sound Management Area. Since 1969 West Coast market conditions are constantly reflected in the catch, especially in 1970 and 1971 when catches were under 100,000 pounds (Table 2).

The king crab fishery has not been heavily exploited, and it has not been necessary to establish restrictive management districts. Two species, the blue and red king crab, are fished commercially in the Prince William Sound Area. Both the blue and red king crab are fished in the Port Wells/Unakwik area, and red king crab is also fished in the Orca Bay/Port Gravina/Port Fidalgo area (Figure 5).

In 1971 a quota of 500,000 pounds was set for king crab, but annual catch has never approached this figure. The high catch of 296,200 pounds was taken in 1972 (Table 3). Regulations limit the commercial catch to male king crab with a minimum size of seven inches in width of shell for red king crab, and five inches in length from the eye notch to the rear center of the carapace for blue king crab.

Razor clams have been harvested from the area since the early 1900's, but during the early 1960's major processing ceased and subsequent years' harvests have been used primarily for bait. The commercial harvest has continued to decline due to health regulations and the apparent decline in populations (Table 4). Department research has shown a decreased survival

Figure 2. Prince William Sound Area Tanner crab districts and major harvest areas.

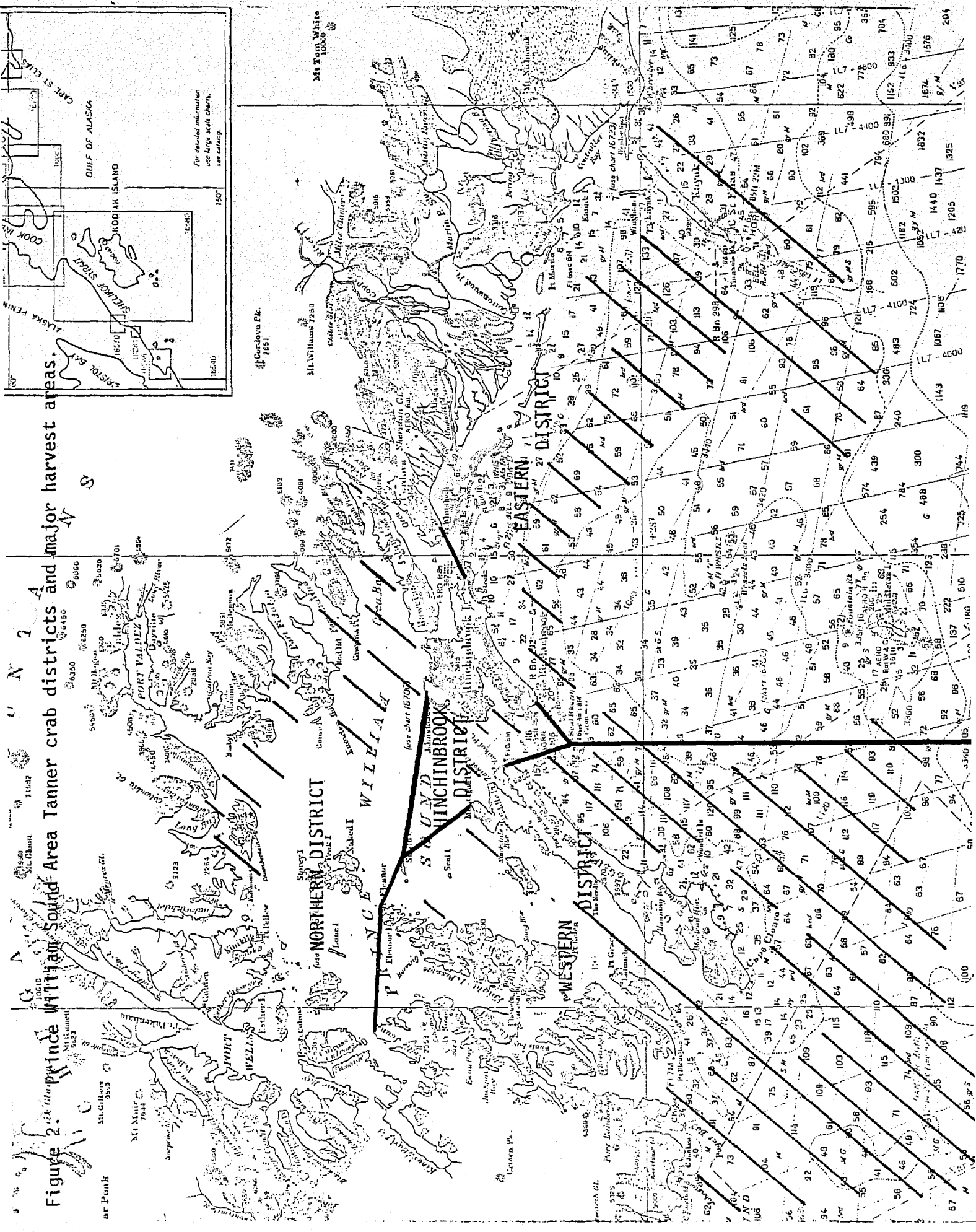


Table 1. Prince William Sound Area historical Tanner crab catch in pounds by season.

<u>Season</u>	<u>Inside</u>	<u>Outside</u>	<u>Total</u>			
1968-69			1,235,613			
1969-70			1,284,597			
1970-71			4,159			
1971-72			7,788,498			
1972-73			13,927,868			
1973-74	1,658,000	8,500,000	10,158,000			
1974-75 1/	1,187,000	2,667,000	3,854,000			
1975-76	3,322,482	3,810,262	7,132,744			
	<u>Northern</u>	<u>Hinchinbrook</u>		<u>Western</u>	<u>Eastern</u>	<u>Vessels</u>
1976-77 2/	782,048	766,650		701,725	70,925	23
1977-78 3/	774,929	897,768		717,739	56,214	37

1/ No concentrated effort until February 1975.

2/ New districts established.

3/ As of March 18, 1978.



Fig. 4. Area index, in rice with rain sound background, 1960-1977.

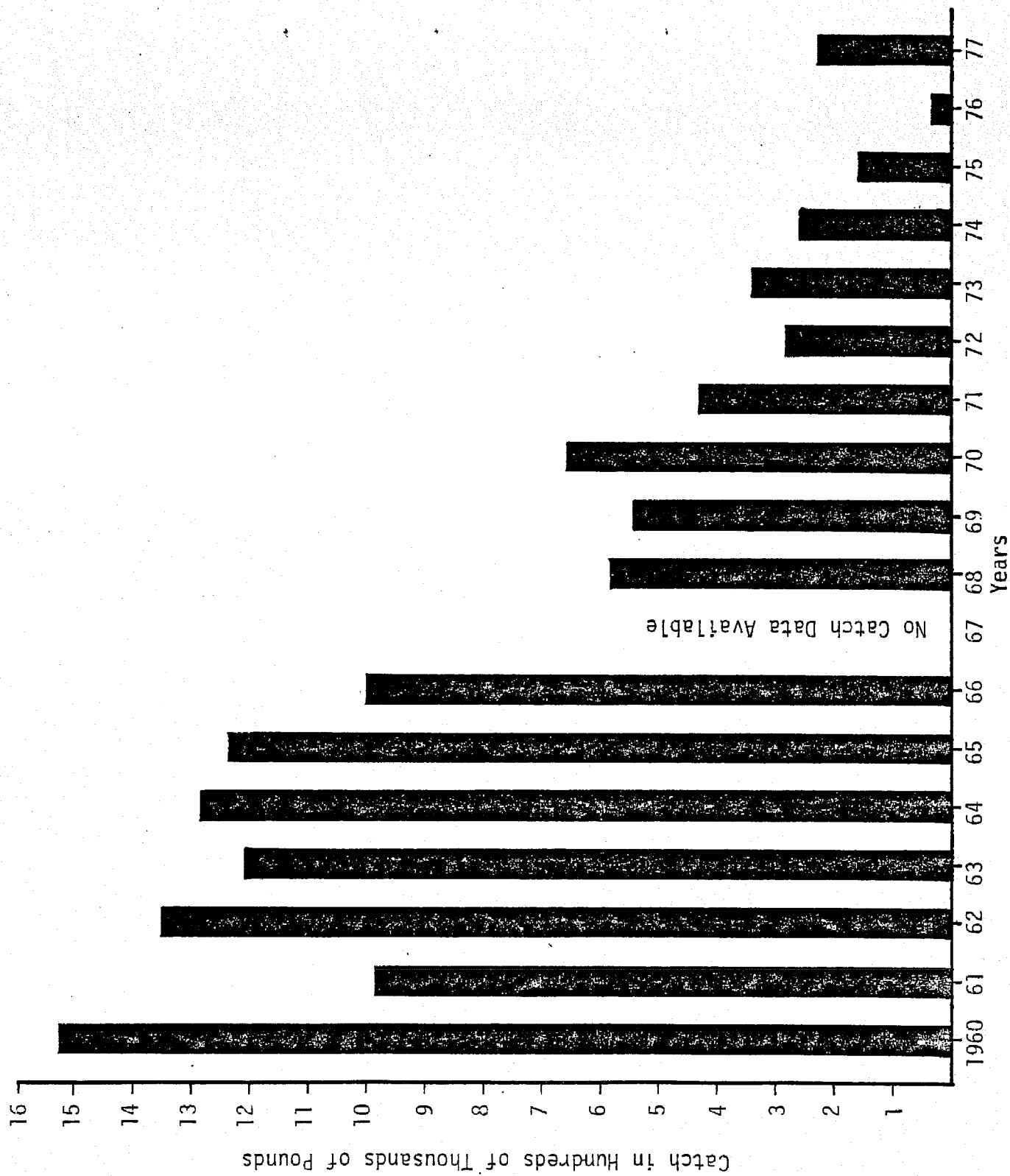


Table 2. Prince William Sound Area Dungeness crab catch, 1960 - 1977.

<u>Year</u>	<u>Copper River Pounds</u>	<u>Vessels</u>	<u>Orca Inlet Pounds</u>	<u>Vessels</u>	<u>Total Catch Pounds</u>
1960	no data available		1,524,326		incomplete data
1961			990,242		
1962			1,353,190		
1963			1,216,846		
1964			1,290,929		
1965			1,240,372		
1966			999,341		
1967		no data available			
1968			579,279		
1969	336,696		541,822		878,696
1970	78,223		660,411		738,634
1971	78,848		430,976		509,824
1972	437,865		286,808		724,673
1973	458,613		347,764		806,377
1974	290,149		269,015		559,164
1975	654,410		163,631		818,041
1976	254,933	4	35,399	3	290,332
1977	506,751	4	228,858	23	735,609



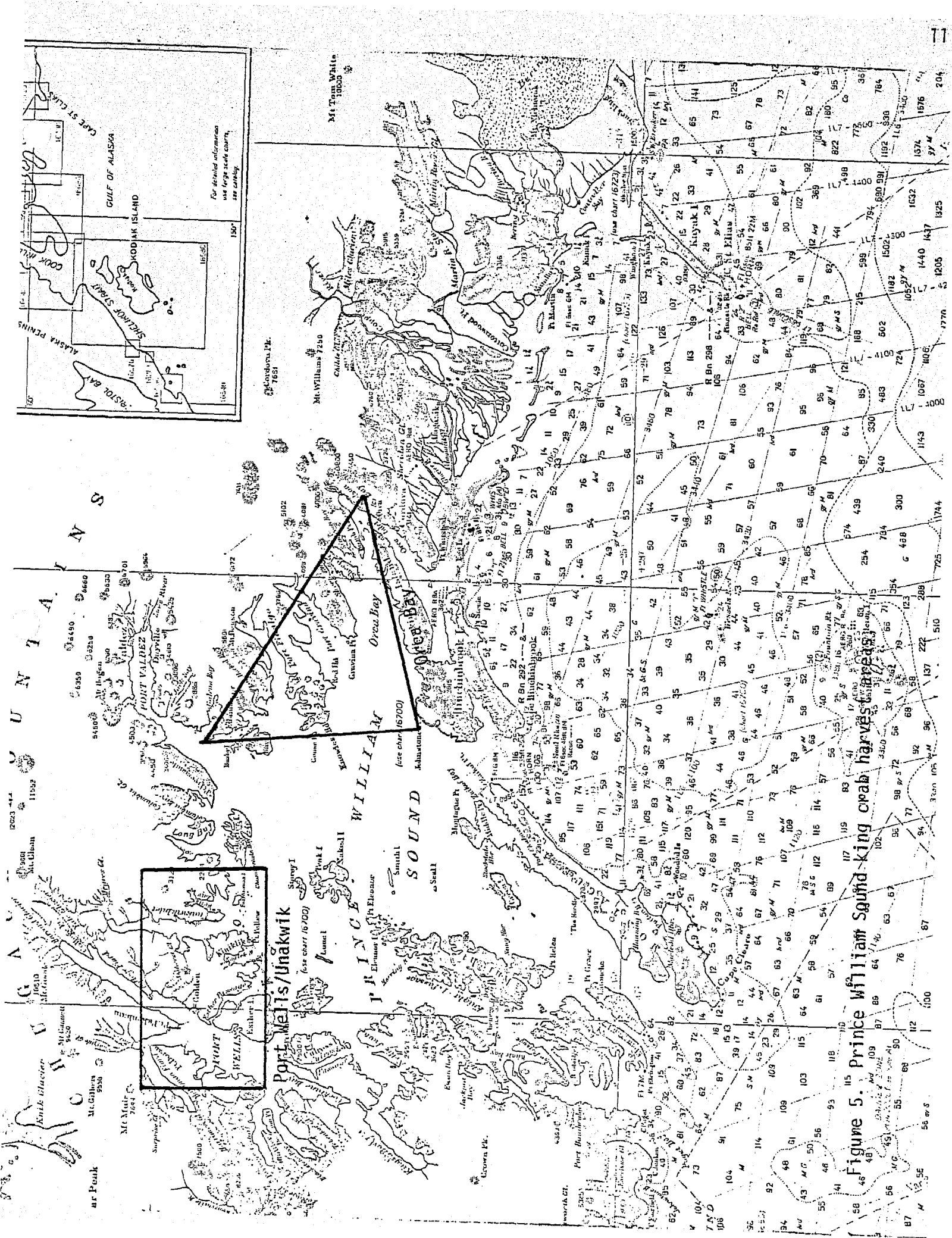


Figure 5. Prince William Sound king crab harvesting area

Table 3. King crab catch in pounds, Prince William Sound Area, 1960 - 1977-78 season.

<u>Year</u>	<u>Pounds</u>	<u>Year</u>	<u>Pounds</u>
1960	246,965	1969	48,100
1961	236,081	1970	94,300
1962	31,478	1971	144,200
1963	43,569	1972	296,200
1964	14,028	1973	207,916
1965	5,500	1974	85,379
1966	11,000	1975	53,423
1967	41,800	1976-77 <u>1/</u>	17,087
1968	200,000	1977-78 <u>1/</u>	86,595

1/ Season.

Table 4. Razor clam harvest in pounds, Prince William Sound Area, 1960 - 1977.

<u>Year</u>	<u>Pounds</u>	<u>Year</u>	<u>Pounds</u>
1960	433,930	1969	26,887
1961	261,628	1970	27,909
1962	208,698	1971	37,972
1963	86,340	1972	30,326
1964	39,275	1973	30,818
1965	86,477	1974	29,747
1966	27,063	1975	15,443
1967	98,446	1976	1,516
1968	72,306	1977	2,160



Table 5. Shrimp harvest in pounds, Prince William Sound Area, 1960 - 1977

<u>Year</u>	<u>Pots</u>	<u>Year</u>	<u>Pots</u>	<u>Trawl</u>
1960	2,494	1969	2,573	
1961		1970	9,888	
1962	1,788	1971	6,537	
1963	550	1972	3,474	5,153
1964	2,124	1973	3,185	4,243
1965	2,178	1974	12,489	1,345
1966		1975	2,075	26,961
1967	374	1976	1,205	134,115
1968	3,433	1977	3,758	170,757

of juvenile razor clams in the Orca Inlet area with the decreased survival appearing to be caused by changing substrate in the razor clam habitat. Deposition by the Copper River and the 1964 earthquake are the two major factors influencing substrate change. Areas of historical harvest are Orca Inlet, Copper River Flats and Controller Bay areas as depicted in Figure 6.

A small pot shrimp fishery has operated for several years in northern Prince William Sound, and in recent years a small otter trawl fishery has operated in eastern Prince William Sound (Figure 7). In 1976 an exploratory trawl fishery by one large vessel from Kodiak was conducted in Icy Bay (western Prince William Sound) with catches of less than 200,000 pounds each year (Table 5).

A recent decision was made by regional and local staff to prepare a separate shellfish and bottom fish report because of the seasonal difference between the salmon and crab fisheries. Therefore, the shellfish text in this report will be limited to the introduction, and interested persons are referred to a separate shellfish - bottom fish report which will be forthcoming at a later time.

### HERRING

Herring fishing districts were established by regulation in 1977 as a result of limited entry into the herring sac roe fishery. These districts generally include the water surrounding Montague and Green Island and designated the Montague district; the Northern district which includes all of Port Fidalgo, all of Valdez Arm and Port Valdez, all of Columbia Bay and Long Bay and water surrounding Glacier Island and Bligh Island; and, the General district includes all water of Alaska between the longitude of Cape Fairfield and the longitude of Cape Suckling, exclusive of the Montague and Northern district described earlier. Because of limited entry into the herring sac roe fishery, the Montague and Northern districts were established exclusively for this herring fishery. The General district remained unregulated to limited entry allowing open fishing for the so-called herring food and bait fishery.

Herring have a long history of commercial fishing in the Prince William Sound Area dating back to 1914, and until about 1958 was used exclusively for reduction purposes. From the demise of the reduction fishery until 1969 only occasional catches were made for bait purposes. The year 1969 was the beginning of a new fishery where herring were taken for roe which was salted in containers and sold in Japanese markets. This herring sac roe fishery grew rapidly with good market conditions reaching a peak harvest of 6,983 tons in 1973 (Table 6).

As a result of the intensiveness of the herring sac roe fishery, vulnerability, and high exploitation rate of the herring, a quota of 5,000 tons was established in 1974. The quota was exceeded two years, in 1974 and 1975, after the quota was established (Table 6).

The herring spawn on kelp fishery started the same year the roe fishery was initiated in 1969. The first experimental harvest of herring spawn on kelp was taken from Johnson Bay and Landlocked Bay in northeastern Prince William Sound. It has grown into an annual fishery with a peak harvest of 458.5 tons in 1975 (Table 6). Recent concern about the depletion of kelp beds (*Laminaria* sp.) resulted in several regulations. Notable of these was

the recent Board of Fisheries regulation to limit the method of harvesting to a hand-held unpowered blade-cutting device, and required the kelp blades to be cut at least four inches above the stipe.

Herring spawning areas are shown in Figure 7 and Figure 8 which generally includes the areas where the spawn on kelp harvest takes place.

Table 6. Herring and herring spawn on kelp in tons from Prince William Sound, 1967 - 1977.

<u>Year</u>	<u>Bait</u>	<u>Used for Roe</u>	<u>No. Boats</u> <u>1/</u>	<u>Spawn on Kelp</u>	<u>No. Permits Issued</u>
1967	30				
1969		355.7	6	2.7	3
1970	10		1	95.2	58
1971	20.03	919.2	14	384.7	487
1972	8.96	1,768.3	15	299.7	1,100
1973		6,983	28	153.2	504
1974		6,371	72 <u>2/</u>	276.1	295
1975	226.7	5,853.8	76	458.5	765
1976		2,584.1	66	242.1	622
1977*		2,283.1	55 <u>3/</u>	208.5	251

1/ Number of herring fishing boats making actual deliveries.

2/ Three drift gill net boats also fished.

3/ One drift gill net boat fished.

\* Preliminary.

The hydrography shown in Columbia and Heather Bays is from preliminary surveys completed by the U.S. Geological Survey in May 1973 and July 1974.

Figure 2

# Valdez Arm Herring Spawning Areas 1977

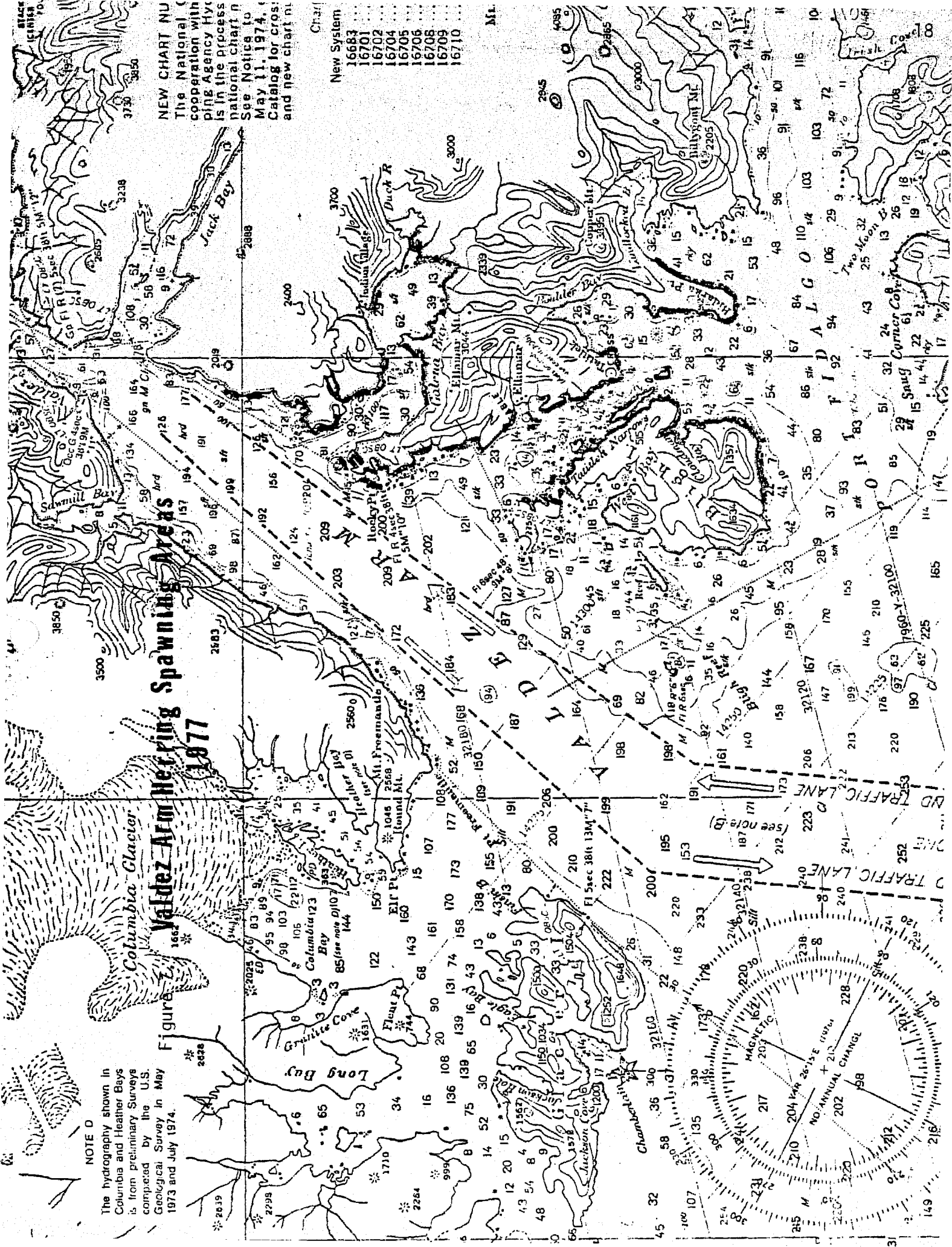
**NEW CHART NUMBER**  
The National Cooperative with Mapping Agency Hydrographic Survey is in the process of publishing a new national chart number. See Notice to Mariners, May 11, 1974, Catalog for cross-referencing old and new chart numbers.

CH 2

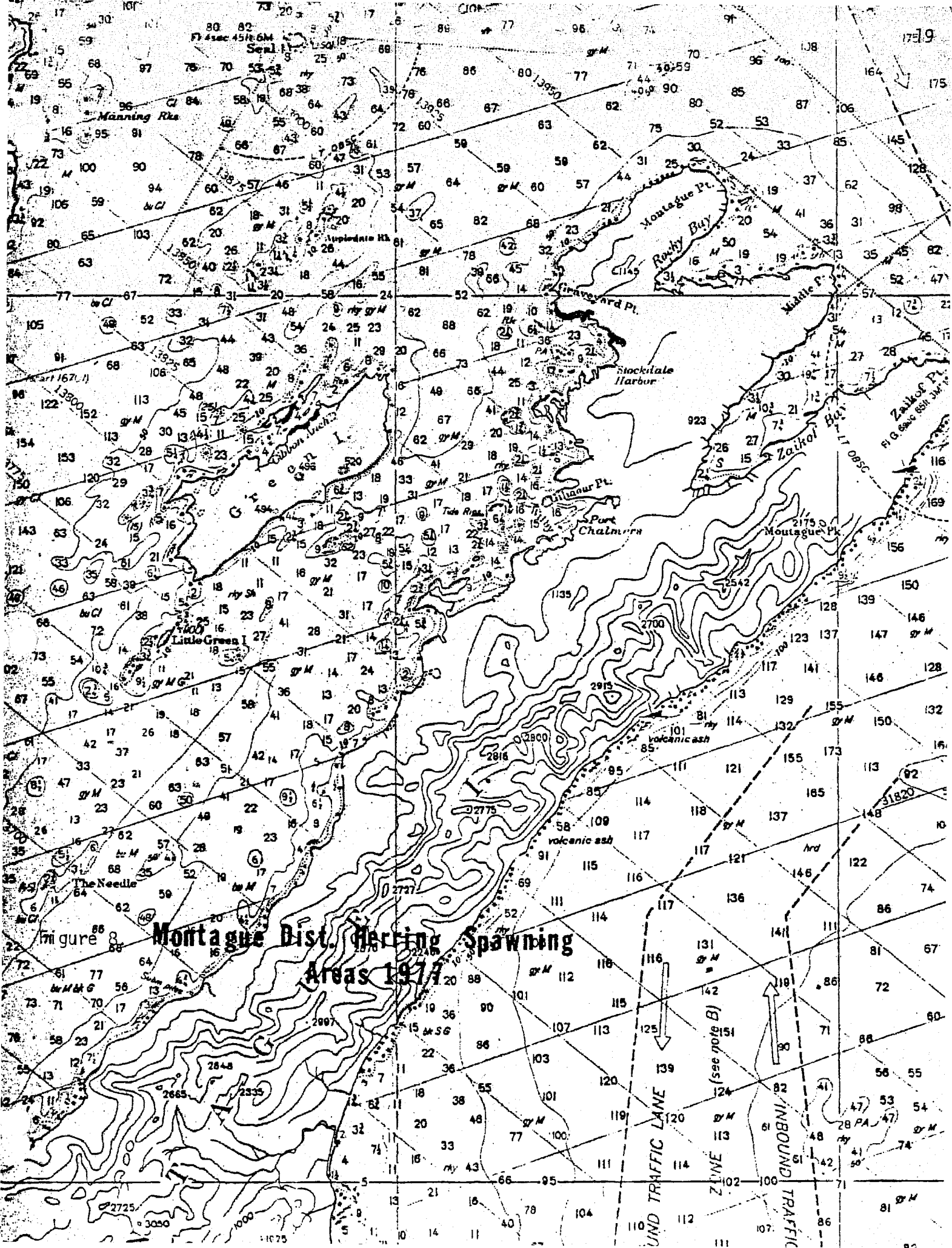
## New System

16683  
16701  
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11







## SALMON FISHERY

### BERING RIVER DISTRICT

Introduction. - The Bering River district includes all water between Cape Martin and Cape Suckling. Salmon commercially harvested in this district normally spawn in streams and rivers emptying into Controller Bay. Sockeye and coho salmon are the primary important species harvested in this district and are taken with drift gill net gear.

Weekly fishing periods for sockeye salmon are divided into two equal open and closed periods of three and one-half days each. Open fishing periods begin at 6:00 a.m. Monday and close at 6:00 a.m. Wednesday and are reopened at 6:00 p.m. Thursday and close at 6:00 a.m. Saturday.

### SOCKEYE SALMON

Catch. - Figure 9 presents the Bering River sockeye salmon catch and escapement for the years 1969 to 1977.

In 1977 the drift gill net season opened at 6:00 a.m. June 13 with 52 boats participating. The sockeye run returning to this district was expected to be weak, but due to the mild winter and warmer water temperatures the run appeared early, resulting in the peak of the return passing through the commercial fishery prior to the opening period. The district was only fished for two weekly periods, and the seasonal total sockeye catch was 14,445 which was about half of the 16 year average. Table 7 gives weekly catch statistics for this fishery.

Escapement. - Sockeye salmon escapement estimates were better than anticipated due to the early, "prior to fishing", return of the run. However, aerial counts indicated that escapements were still below average. Table 8 presents comparative escapement counts for the years 1972 to 1977 into indexed streams of the Bering River system.

### COHO SALMON

Catch. - Figure 10 presents the Bering River coho salmon catch for the past 13 years. In 1976 the season in this district was reduced from five to three and one-half days per week, but the 1977 catch of 48,215 was the highest catch made since 1973 and was only slightly below the 16 year average for the periods fished. Weekly catch is shown in Table 7.

Escapement. - Comparative, year to year, escapement estimates are very difficult to obtain. The weather at this time of the year is normally adverse with heavy rain and high wind. Streams become high and silt laden, and turbulence caused by wind makes aerial surveys almost an impossibility. However, in 1977 the weather remained good until mid September, and the early surveys that could be flown did indicate that escapements would be above average.

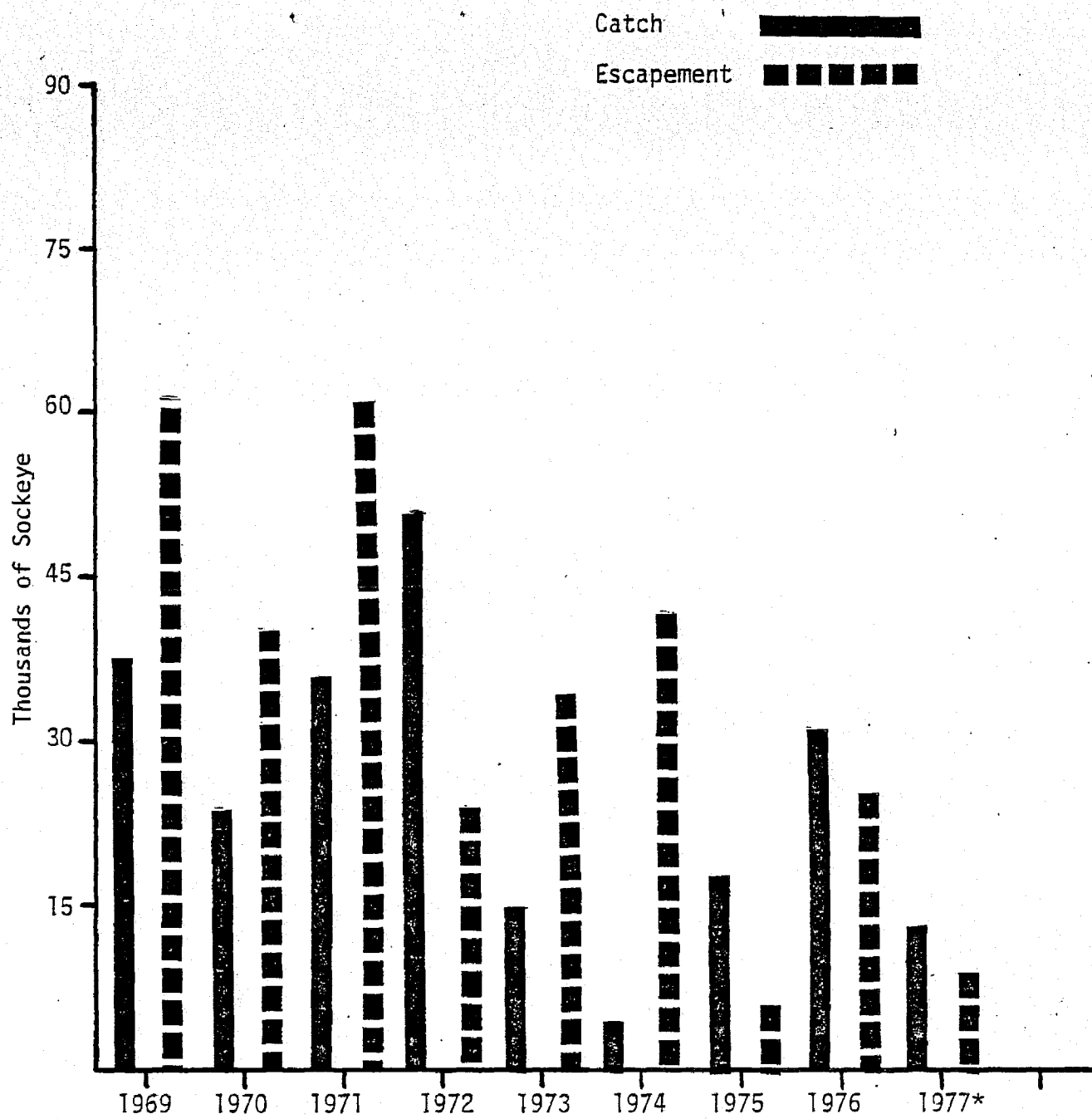


Figure 9. Bering River sockeye salmon catch and escapement, 1969 - 1977.

\* Preliminary.

Table 7. Bering River salmon commercial catch by week, 1977. 1/

Week	King	Sockeye	Coho	Pink	Chum	Total	No. Boats
25	117	10,445		85		10,647	52
26	10	3,986		63	219	4,278	25
34			726	2		728	9
35		5	7,572	20	1	7,598	29
36		9	20,011	20	1	20,041	
37			14,501	1		14,502	
38			5,405			5,405	
TOTAL	127	14,445	48,215	191	221	63,199	

1/ Preliminary.

Table 8. Comparable estimated sockeye salmon spawning escapements in selected systems, Copper River - Bering River districts, 1972 - 1977. 1/

System	1972	1973	1974	1975	1976	1977*
Eyak Lake	12,275	6,000	4,625	17,500	8,500	11,000
McKinley Lake	600	1,800	2,000	8,000	6,000	15,000
39 Mile Creek	14,910	5,511	2,400	2,500 <sup>4/</sup>	3,500	4,500
Lake Tokun	1,850	8,000	1,468 <sup>3/</sup>	1,200 <sup>4/</sup>	8,500	5,500
Little Martin Lake	3,000	1,500	1,500	2,000	8,000	1,550
Martin Lake	6,500 <sup>2/</sup>	2,000	1,500	460	4,000	6,087
Martin River Slough	5,000	1,990	5,000	400	2,500	3,100
Copper River Delta Subtotal	44,135	26,801	18,493	32,060	41,000	46,737
Bering Lake	20,000	23,000	20,575	4,000	12,000	8,000
Dick Creek	16,000	9,600	6,600	1,970	5,000	1,500
Shepherd Creek	6,000	3,000	15,000	150	5,500	glacial
Bering River Subtotal	42,000	35,600	42,175	6,120	22,500	9,500
Mentasta Lake	1,450	6,196	700	450	600	3,500
Gulkana River	1,280	32,812	15,780	7,766	19,693	28,071
St. Anne Creek	1,900	7,400	2,100	499	1,700	7,100
Mahlo River	1,525	4,500	500	314	600	5,200
Mendeltna Creek	2,404	2,868	332	325	900	1,250
Upper Copper River Subtotal	8,559	53,776	19,412	9,254	23,493	45,121
TOTAL	94,694	116,177	80,080	47,434	86,993	101,358

1/ Peak count estimates from aerial and ground counts unless otherwise noted.

2/ Includes 1,500 at mouth of Martin River.

3/ Weir count.

4/ Weir count was 329 sockeye.

\* Preliminary.

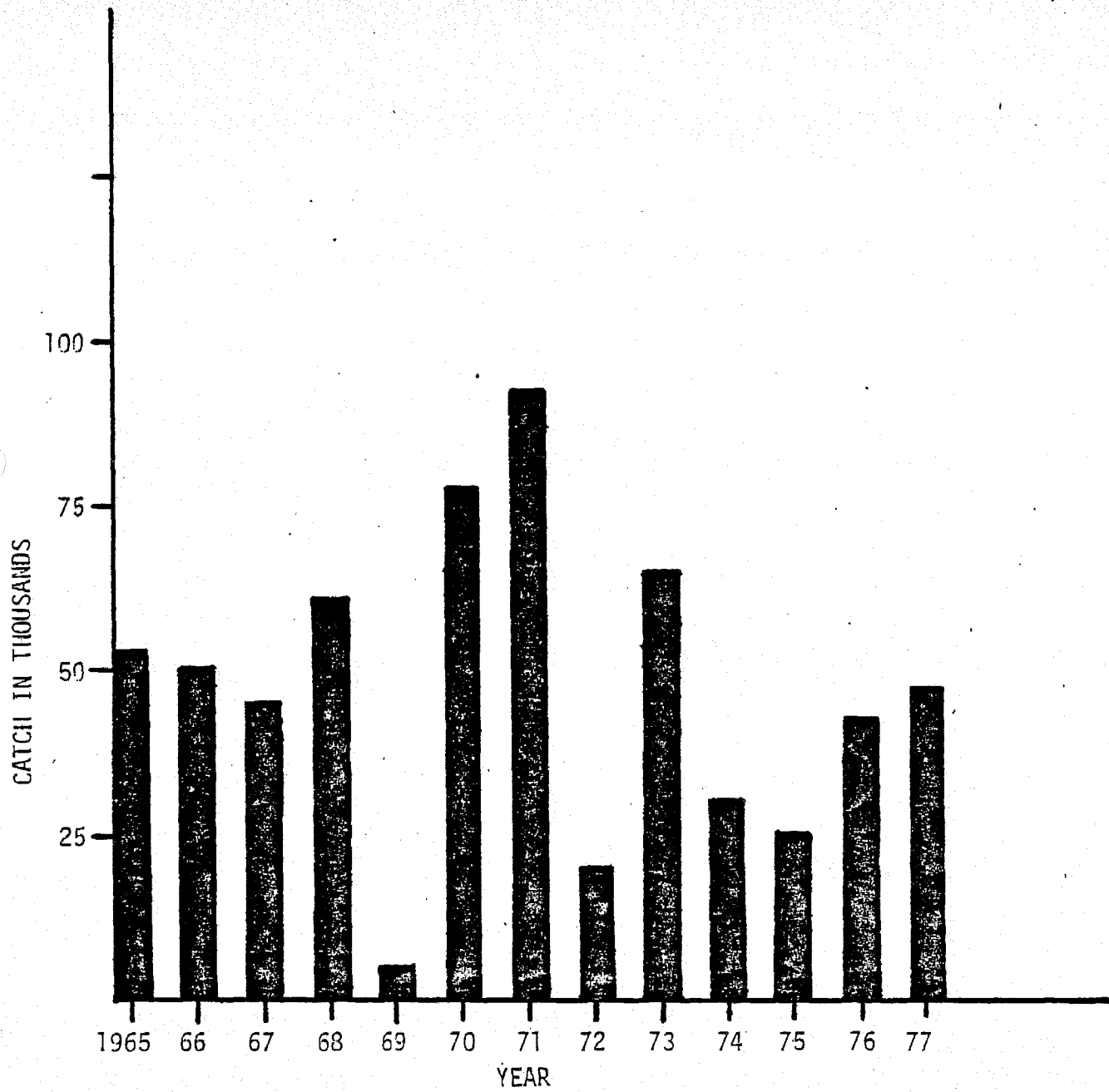


Figure 10. Bering River coho salmon catch 1965 - 1977.

Introduction. - As described in the Commercial Fishing Regulations the Copper River district includes all water of Hinchinbrook Island between Hook Point and Boswell Rock to the radio tower at Whitshed Village. All waters between Whitshed Village and Cape Martin are also included in this district.

Commercial fishing for sockeye salmon in this district begins on May 15 of each year, and is regulated by a series of equal open and closed fishing periods. Prior to August 7, fishing is permitted from 6:00 a.m. Monday to 6:00 a.m. Wednesday, and from 6:00 p.m. Thursday until 6:00 a.m. Saturday. After August 7 fishing is permitted for coho salmon from 6:00 a.m. Monday until 6:00 p.m. Thursday. After August 31, fishing is permitted from 7:00 a.m. Monday until 7:00 p.m. Thursday. Each boat registered to fish this district is allowed a maximum of 150 fathoms of drift gill net gear.

The major commercial harvest occurs on sockeye and coho salmon although king, chum and pink salmon are also taken incidentally.

Unlike many areas of the State where fishing time adjustments can be made to allow for additional escapement during the season, upper Copper River sockeye salmon escapement trends are unknown until catch trends are received from the upriver subsistence fishery. This time lag may be 30 or more days after the fish have passed through the commercial fishery. Because of this time lag, the in-season management of the fishery is based on weekly catch per unit of effort data. Basically, what is done is: commercial catch and effort by week for the past ten years are combined and cumulative percentage of catch factors and effort calculated. A prediction, based on these percentages, is made which estimates catch by week, and season total catch. Any drastic decrease below the weekly predicted catch can be responded to by adjusting the fishing periods. The one drawback of this method is the time lapse between the period closure and receipt and tabulation of fish tickets for the past period, which at a minimum, is four days. This lapse of time allows commercial fishing to be pursued for two full days before the catch information can be calculated and a decision made to either decrease, prohibit, or continue fishing.

During the 1977 season this particular method of "in-season management" was somewhat inaccurate, and catches fell below predicted levels. This was due to the early arrival of the return and the fishing delay caused by the strike, and attempting to predict weekly and seasonal catches with these variables was somewhat of an impossibility.

#### SOCKEYE SALMON

Catch. - As in many past years of this fishery, fishermen - processor price agreements had not been reached when the season opened on May 16. Negotiations continued until May 18 when a price settlement was reached, and fishing commenced at 6:00 p.m. May 19.

The season was characterized by good weather, and very little lost time due to adverse seas. However, it was apparent that the salmon runs were seven to ten days early in returning, and coupled with the three day fishermen strike, portions of the early run passed through the fishery untouched.

During the second open period 391 boats harvested 123,207 sockeye salmon. Fishing effort increased to 447 boats the following week, and the catch also

increased to 171,234 sockeye. Peak effort occurred during the week of May 29 to June 4 when 449 boats participated in the fishery. Effort declined after that date with the opening of the Bering River district, and later with the opening of the Coghill - Unakwik districts.

The seasonal catch of 615,435 sockeye salmon was approximately 45,000 below the 16 year average, but when considering the early arrival of the run, and the further fishing delay caused by the strike, overall run strength would have to be considered above average.

Figure 11 presents catch and escapement for this fishery for the past nine years while Table 9 presents catch by week for the season.

Subsistence Fishery. - In 1977, 540 fishwheel and 3,526 dip net permits were issued for the subsistence fishery in the Chitina area of the upper Copper River. This was 1,103 permits more than were issued in 1976.

Individuals fishing these permits harvested 35,363 sockeye and 2,171 king salmon for a total of 37,534. The total catch is approximately 15,000 fish above the 1976 reported catch.

Subsistence fishermen utilizing drift gill nets on the Copper River delta harvested 10 king salmon and 71 sockeye salmon. Twenty-four subsistence drift gill net permits were issued in 1977.

Table 10 presents catch data for the upper Copper River area and the Copper River delta.

Escapement. - Escapement estimates are derived primarily from aerial estimates, ground or foot counts, and from weirs which have been placed on three specially selected spawning systems.

The sockeye salmon escapements into spawning systems of the upper Copper River were very good in 1977, due in part to the early arrival of this run and the fishermen's strike at the beginning of the season.

Runs returning to Copper River delta are later in timing, and returned after the fishermen's strike was settled. These stocks were subjected to normal fishing pressures, and escapements varied from average to slightly below average.

Table 3 compares escapement estimates for selected systems in the upriver and delta areas for the years 1972 - 1977.

## KING SALMON

Catch. - The king salmon runs into the Copper River coincide with the upriver sockeye salmon runs. Because of this, the king salmon fishery is an incidental catch fishery with the majority of the harvest taken with standard, 5 3/8 inch mesh, sockeye salmon gear.

The king salmon return, like the sockeye return, was approximately seven to ten days early. This and the aforementioned strike, allowed the early portion of the run to pass, unmolested, through the fishery. Even though the early run was missed, the season total catch of 21,995 king salmon was approximately 4,000 above average. Table 9 presents catch by week for this fishery.



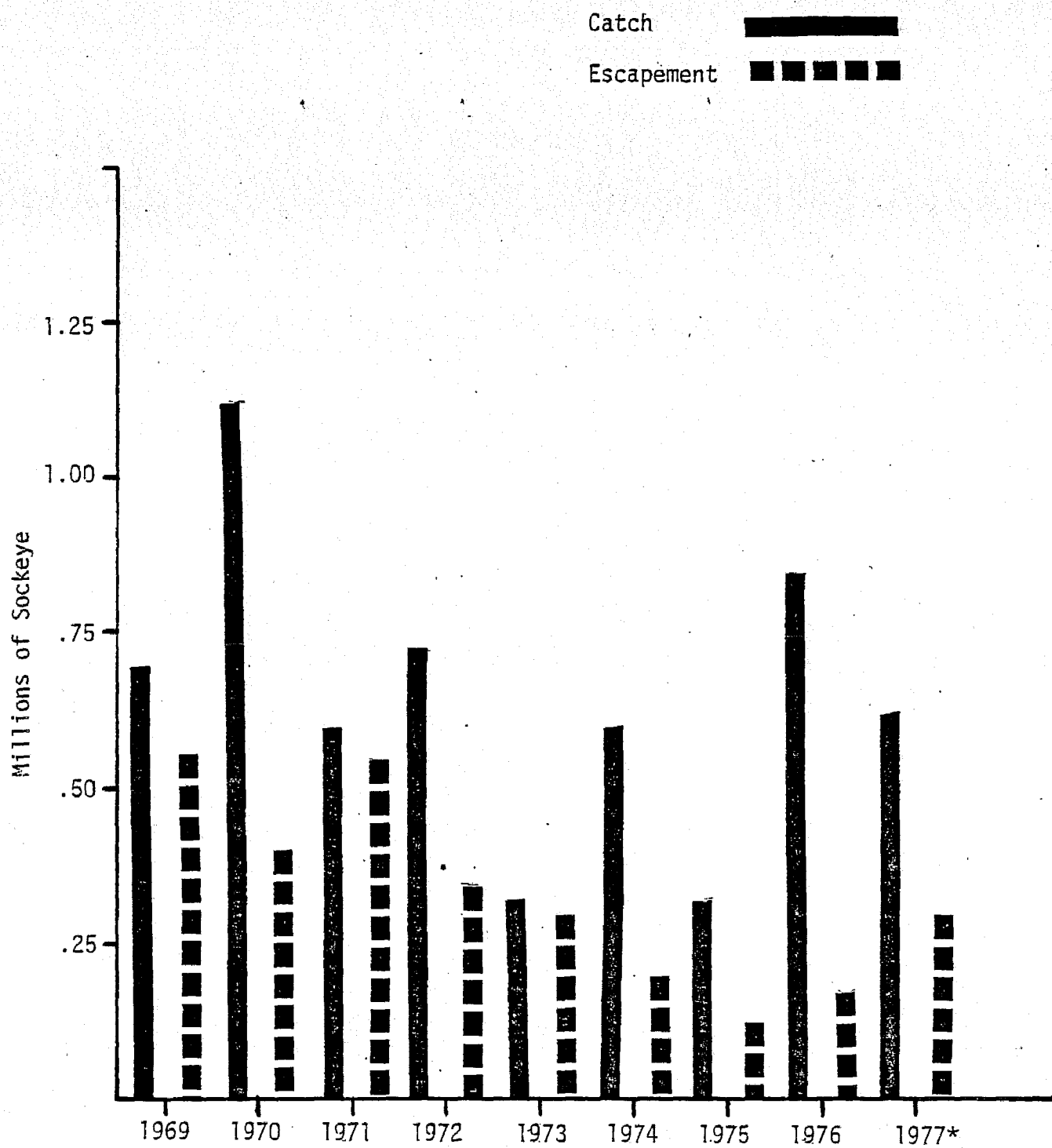


Figure 11. Copper River sockeye salmon catch and escapement, 1969 - 1977.

\* Preliminary.

Table 9. Copper River salmon commercial catch by week, 1977. 1/

Week	King	Sockeye	Coho	Pink	Chum	Total	No. Boats
21	5,618	123,207			87	128,912	391
22	6,429	171,234		1		177,664	447
23	5,317	116,346			2	121,665	449
24	2,892	66,335	3	1,049	63	70,342	442
25	1,195	45,315	3	2,346	56	48,915	352
26	432	37,874	1	2,951	69	41,327	196
27	66	19,753	1	2,062	6	21,888	90
28	14	11,218	1	1,482	2	12,717	44
29	8	9,767		4,224	15	14,014	48
30	8	8,540	19	4,794	3	13,364	47
31	3	4,077	1,226	2,748	25	8,079	53
32	2	895	2,502	468	1	3,868	44
33	2	354	1,585	91	1	2,033	25
34	6	325	18,548	268	1	19,166	128
35	2	125	30,355	166	46	30,694	194
36	1	38	40,756	25		40,820	
37		25	19,256	10	3	19,294	
38		7	17,020	4		17,031	
TOTAL	21,995	615,435	131,276	22,707	380	791,793	

1/ Preliminary.

Table 10. Prince William Sound Area subsistence fishery, 1977.

Area	Number Permits Issued	Number Permits Returned	Type of Gear	Catch			
				Sockeye	Kings	Cohos	Other <sup>2/</sup>
Upper Copper River <sup>1/</sup>	540	449	Fishwheel	13,594	738	29	90
Upper Copper River <sup>1/</sup>	3,526	2,860	Dip Net	22,755	1,475	425	42
Copper River Flats	23	22	Gill Net	71	10	0	
Prince William Sound	4	4	Gill Net	0	0	0	
Eyak, McKinley, and Hartney Bay Lakes <sup>3/</sup>	4	3	Gill Net				76
TOTAL				36,420	2,223	454	208

<sup>1/</sup> Compiled from reports received through January 26, 1978.

<sup>2/</sup> Includes pink salmon, whitefish, steelhead, cutthroat, Dolly Varden, lamprey, lingcod and grayling.

<sup>3/</sup> Whitefish permits. Catch included 57 Dolly Varden, 12 whitefish and 7 cutthroat.

Table 11. Copper River and Bering River sockeye, chinook and coho salmon escapement, 1977. 1/

Location	Glacial	Date <sup>2/</sup>	Method	Sockeye	Chinook	Coho
Eyak River						
Hatchery Creek		7/ 7	G	600+		
Eyak Lake		7/7 & 9/12	A&B	11,500		200
Ibek Creek		9/14	A			3,500
Scott Lake	Murky					
Bear Lake	"					
Power Creek	Glacial	7/ 7	A	1,500		
Alaganik Slough						
McKinley Lake		7/ 7	A	15,000		
Salmon Creek		9/14	A	1,000+		1,300
Pete Dahl Slough						
Mile 26 and 27 Creeks		7/ 7	A	3,500		
Copper River Delta						
Mile 39 Creek		8/29 & 9/14	A	4,500		3,000
Goat Mountain Creek		7/ 7	A	150		
Pleasant Creek		7/9 & 9/14	A	650		1,500+
Martin River						
Tokun Lake		weir		4,676		
Tokun River		8/29	A	350		
Martin Lake		weir		6,087		
Martin Lake Outlet		8/29	A	150		2,000
Martin Feeders		weir				
Little Martin Lake		7/ 7	A	1,550		
Pothole Lake		weir				
Ragged Point Lake		8/29	A	3,500		
Ragged Point Outlet		8/29	A	250		300
Martin River Slough		7/9 & 8/29	A	3,100		6,500
Bering River						
Bering Lake		7/7 & 9/14	A	8,000		165
Dick Creek		7/7 & 9/14	A	1,500		500
Shepard Creek	Glacial					
Carbon Creek	Murky					
Maxwell Creek		NS				
Kushtaka Lake	Glacial					
Clear Creek	Muddy					
Trout Creek	"					
Katalla River		8/29	A			5,000
Stillwater Creek	Glacial					
Bremner River						
Peninsula Lake		NS				
Salmon Creek		NS				
Steam Boat Lake		NS				
Tiekel River Lake		NS				
Tonsina River	Glacial					
Lower Tonsina Creek		NS				
Little Tonsina River		8/ 3	G		35	74
Tonsina Lake		NS				
Bernard Creek		NS				

Table 11, cont. Copper River and Bering River sockeye, chinook and coho salmon escapement, 1977. 1/

Location	Glacial	Date <sup>2/</sup>	Method	Sockeye	Chinook	Coho
Klutina River	"		G	2,000		
Manker Creek		7/30	A		15	
Mahlo Creek		7/30	A	5,200		
Hallet Slough		7/30	A	525		
Curtis Creek		7/30	A	0		
St. Anne Creek		7/30	A	7,000	10	
Tazlina River	"					
Mendeltna Creek		8/19	A	3,900	73	
Gulkana River		7/29	A		850	
West Fork		7/24	A	1,150	15	
Moose Creek		7/24	A	0	0	
Keg Creek		7/24	A	725		
Unnamed Creek		7/24	A	1,225		
Middle Fork		7/24	A	1,810	169	
Dickey Lake		7/24	A	650		
Swede Lake		7/24	A	750		
Hungry Hollow Creek		7/24	A	0	11	
East Fork						
East Fork to Paxson Lake		8/19	A	3,800	45	
Paxson Lake		8/19	A	0		
Paxson Lake Inlet		8/19	A	5,600		
Paxson Lake to Mud Creek		8/19	A	6,000		
Mud Creek		8/19	A	650		
Mud Creek to Summit Lake		8/19	A	5,900		
Fish Lake		7/24	A	8,000		
Summit Lake		7/24	A	0		
Gunn Creek		7/24	A	11		
Chistochina River	"					
East Fork		8/ 5	A	0	132	
Eagle Creek		3/ 5	A	30	5	
Mankomen Lake		8/ 5	A	0		
Slana River	"					
Mentasta Lake		7/24	A	3,500		
Fish Creek		7/24	A	6,900		
Bad Crossing #1		7/24	A	300		
Bad Crossing #2		7/24	A	8,100		
Suslota Lake		8/19	A	300		
Slana Sloughs		8/19	A	2,000		
Bone Creek		8/19	A	450		
Indian River		NS				
Tanada Creek		9/19	A	2,000		
Tanada Lake		9/19	A	7,100		
Copper Creek						
Copper Lake		9/19	A	1,950		
Copper River						
Boulder Creek Tributary		7/24	A		2	
Lakina River						
Long Lake		7/30-8/21	weir	8,772		
Clear Creek		NS				

Table II, cont. Copper River and Bering River sockeye, chinook and coho salmon escapement, 1977. 1/

Location	Glacial	Date <sup>2/</sup>	Method	Sockeye	Chinook	Coho
Tana River	"					
Tana River Clear Channels	"	NS				
Tana Lake Inlet	"	NS				
West Fork Clear Channels		NS				
TOTAL				163,860	1,362	24,039

1/ Escapement refers to peak survey.

2/ Date refers to peak sockeye salmon escapement. It may or may not refer to chinook or coho salmon counts.

A Signifies survey from the air.

B Signifies survey on the ground.

## COHO SALMON

Catch. - The 1977 coho salmon season was the second season that this fishery has been regulated as a three and one-half day per week fishery. Due to annual increases in the price paid for cohos, and associated effort increases, desired levels of coho escapements were becoming more difficult to achieve. Because of this, the Board of Fisheries adopted a regulation which decreased fishing time from five to three and one-half days per week.

In 1977 the coho season opened August 8 and closed September 15. The season total catch of 131,276 cohos represents a catch increase over the last three years, but when compared to catches made during the last 16 years is approximately 12,000 below average.

Figure 12 presents the coho salmon catches for the years 1965 - 1977.

Escapement. - Because of the normal adverse weather encountered during the fall coho seasons, comparable escapement indices are not available. However, unusually fair weather prevailed during the early fall period in 1977, and escapement surveys flown during this period indicated strong coho escapements into many delta streams.

Table 11 presents sockeye, chinook and coho salmon escapement into the Copper River and Bering River systems in 1977.

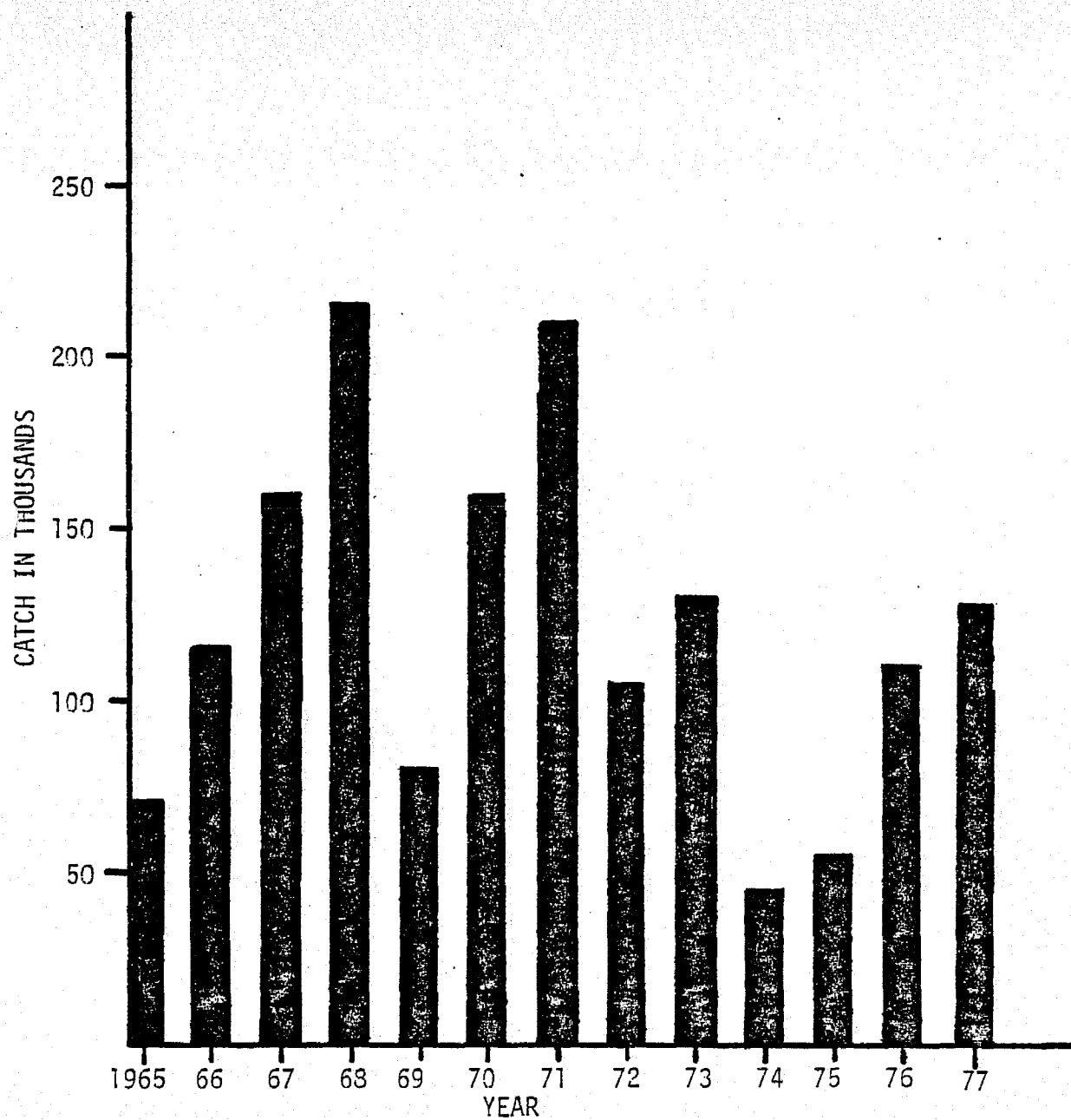


Figure 12. Copper River coho salmon catch, 1965 - 1977.



## SALMON FISHERY

### PRINCE WILLIAM SOUND GENERAL DISTRICTS

Introduction. - The General Districts include all of Prince William Sound exclusive of the Coghill, Unakwik and Eshamy districts, and is made up of the Eastern, Northern, Northwestern, Southwestern, Montague and Southeastern districts inclusively, Figure 1. The legal gear is purse seine, and the fishery is managed primarily for pink and chum salmon which provide about 95 percent of all the species catch.

Fishing seasons vary from year to year, but generally begin in early or mid-July (late July in some years) depending upon the strength of various segments of the runs, and usually extend into the first or second week of August. For several years the weekly fishing was five days per week, 6:00 a.m. Monday until 6:00 a.m. Saturday, but in 1970 the weekly fishing time was changed to 6:00 a.m. Monday until 9:00 p.m. Friday, which is the present weekly fishing period.

Legal gear, as indicated, is purse seine, and each seine is limited to a maximum of 150 fathoms in length and a maximum depth of 17 fathoms. Leads of a maximum length of 75 fathoms may be used with the purse seine. Two methods of using seine leads have been employed in Prince William Sound: 1) attaching the lead to the shore and fastening the outer end to the seine by use of the seine jitney (skiff). Fishing done in this manner is referred to as a hook haul; and, 2) double-pinning the lead and seine (overlapping) and using the whole as a single net. The seine and lead are often used in this manner to make open water tow-hauls.

The Prince William Sound 1977 general purse seine fishery was scheduled to open on July 11, but aerial surveys conducted during June showed earlier and stronger than anticipated pink salmon runs, and the purse seine season was opened two weeks earlier on June 27 in limited areas. The remaining Sound, except Montague district, opened July 4, and fishing continued five days per week, and was closed by emergency order on July 29 at 9:00 p.m. Surplus stocks of both pink and chum salmon allowed a limited fishery in Valdez Arm and Port Fidalgo in the Eastern district on August 13 and 14. Montague district was open to fishing from July 23 to July 29.

### PINK SALMON

Forecast. - The preliminary forecast of the 1977 pink salmon return was a point estimate of 6.3 million with a range estimate of 3.1 million to 9.5 million, based upon pre-emergent fry indices obtained from a standard list of streams and sample zones. (Informational Leaflet No. 171, January 1977).

Total pink salmon return estimated from catch and escapement was 6.2 million which compares almost exactly with the point forecast of 6.3. The percent of error is +1.59, Table 12.

Catch. - The catch for the General Districts by week for all species is shown in Table 13. Figures 13 and 14 show the odd and even year pink salmon catch and escapement for all districts for the past 10 year period.

Table 12. Comparison of Prince William Sound pink, chum and sockeye salmon run forecasts showing the percent of error, 1962 - 1977.

Year	Pink			Chum			Sockeye		
	Mean Forecast 1/	Return 1/	Percent Error 2/	Mean Forecast 1/	Return 1/	Percent Error 2/	Mean Forecast 1/	Return 1/	Percent Error 2/
1962	8.9	8.7	+ 2.25						
1963	5.0	6.6	-32.00						
1964	6.1	6.0	+ 1.64	1.00	0.92	+ 8.00			
1965	4.2	3.4	+19.05	0.73	0.39	+46.58			
1966	6.3	4.0	+36.51	0.58	0.65	-12.07			
1967	3.3	3.8	-15.15	0.44	0.45	- 2.27			
1968	3.1	3.5	-12.90	0.68	0.55	+19.12			
1969	5.8	5.9	- 1.72	0.44	0.48	- 9.09	0.19	0.18	+ 5.26
1970	4.4	3.8	+13.64	0.34	0.33	+ 2.94	0.09	0.04	+55.55 *
1971	6.2	9.5	-34.57	0.76	0.74	+ 2.63.			
1972	1.7	0.9	+47.06	0.80	0.47	+41.25			
1973	2.7	3.3	-17.85	0.64	1.28	-100.00			
1974	2.0	1.3	+35.00	0.29	0.28	+ 3.45			
1975	4.3	6.1	-41.86	0.22	0.15	+31.81			
1976	6.7	3.9	+41.79	1.80	0.46	+74.44			
1977	6.3	6.2	+ 1.59	0.75	0.71	+ 5.63			

**1/ In millions of fish.**

(Mean Forecast minus Actual Estimated Return)

Mean Forecast

3/ Weighted fry densities to include upstream production indicated 5.8 million, or an error of -13.2 percent.

Using expanded estimate of 4 year return to total.

Estimated.

Table 13. General Districts purse seine salmon catch by week, by species, 1977.<sup>1/</sup>

Week	King	Sockeye	Coho	Pink	Chum	Gear
27	115	17,457	33	798,904	74,927	170
28	189	24,961	43	433,729	112,278	173
29	76	32,085	221	668,090	66,708	204
30	35	22,734	140	923,910	48,404	
31	34	7,570	208	946,084	46,342	223
33	0	8	7	64,535	37,975	114
34	0	3	0	21,959	7,650	72
TOTAL	449	104,808	652	3,857,211	394,284	

<sup>1/</sup> Preliminary.

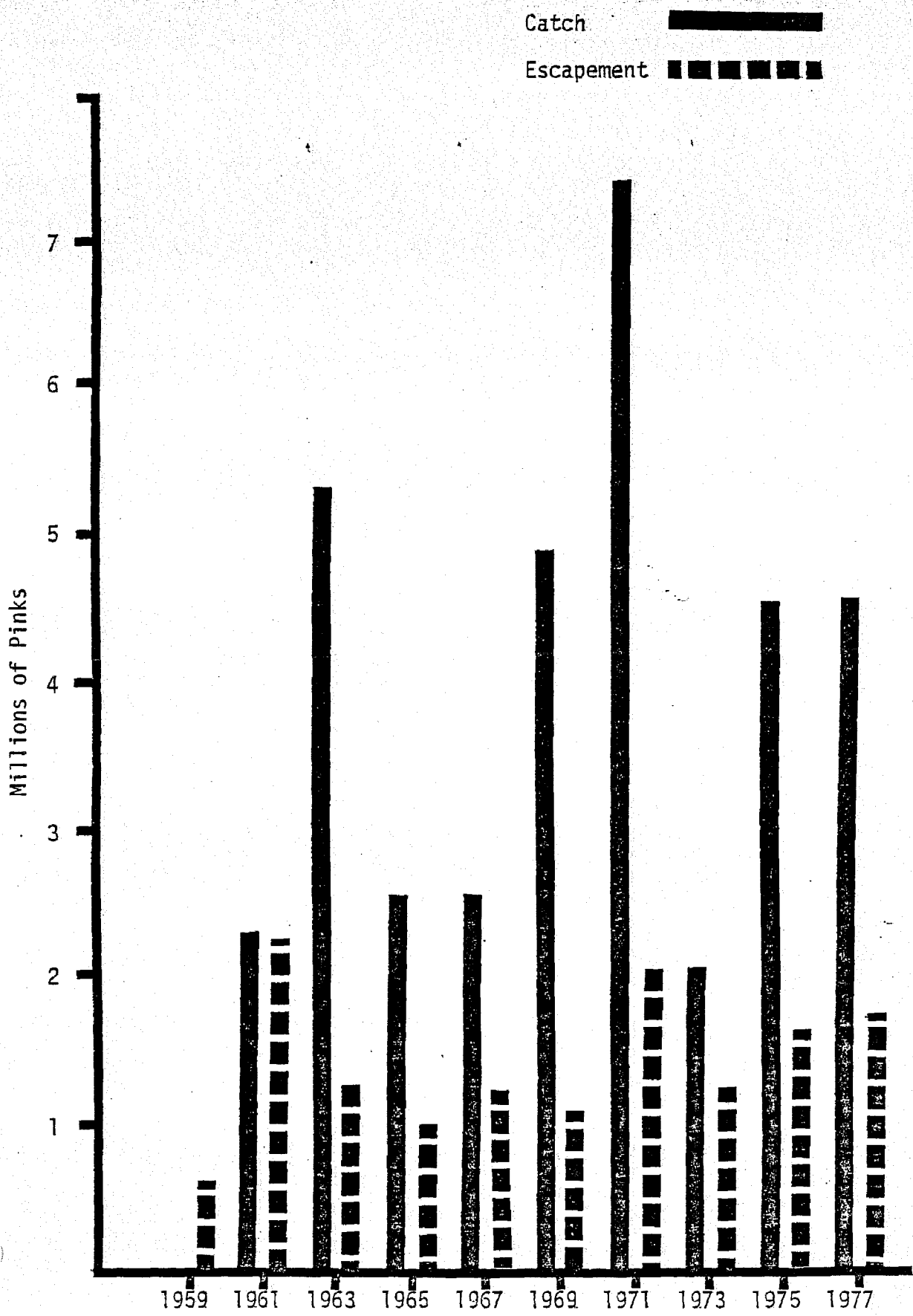


Figure 13. Prince William Sound pink salmon odd year catch and escapement.

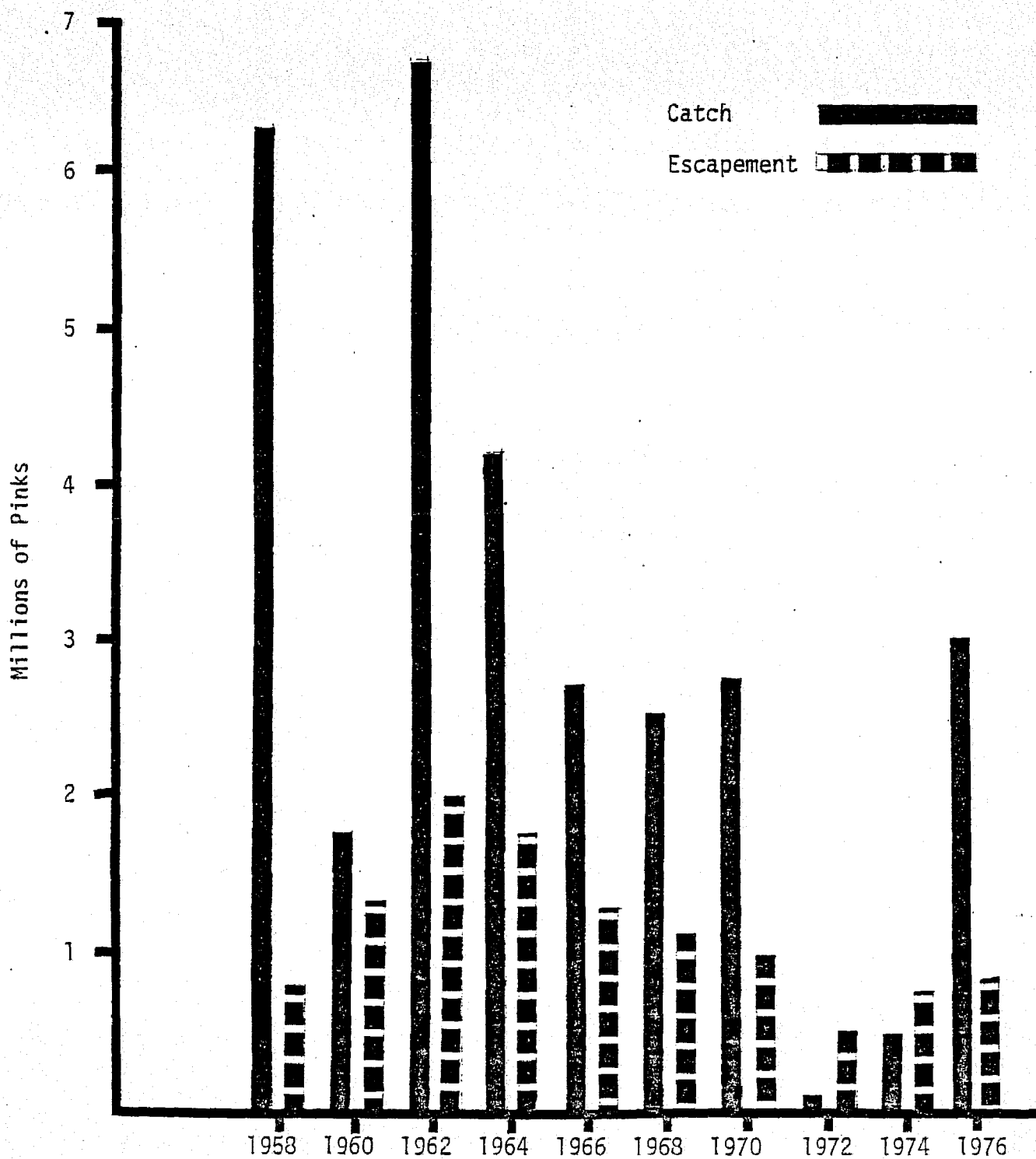


Figure 14. Prince William Sound pink salmon even year catch and escapement.

As expected from the forecast, the early and middle portions of the pink salmon run provided the bulk of the catch for pink salmon with Coghill and the Eastern district providing most of the early runs, and the Eastern and South-eastern district the middle run strength.

Pink salmon runs appeared in Prince William Sound approximately ten days to two weeks earlier than normal in 1977, and the abundance of early run pinks allowed a fishery in late June in the Eastern, Southwestern and Culross Island subdistrict. A large run of pinks was evident in the Coghill district, returning to Coghill River, which in part, led to the decision to open the Culross Island subdistrict and Southwestern district on June 27. One week later, on July 4, the Southeastern, Northwestern and portions of the Northern district were included in the fishery. Several weak areas in the Northern district remained closed, and the Unakwik district was closed on July 4.

As the season progressed it became evident from aerial surveys that late run stocks of pinks were generally weak and would not support full fishing effort, and the general season was therefore closed on July 29. Some late producing streams in the Eastern district, primarily Duck River in Galena Bay, and chum streams in Port Fidalgo, had a surplus above spawning needs, and fishing was allowed for two days on August 13 and 14.

Table 14 presents the pink salmon catch for all gear for all Prince William Sound districts from 1968 to 1977.

Escapement. - Weekly aerial spawning escapement counts and periodic ground surveys were conducted throughout the season beginning in late June and terminating in early September. Escapement estimates of pinks in closed areas and in streams are used for in-season management and for calculating season escapements. Estimated pink salmon escapement by district is summarized in Table 15 which also shows a comparison with desired escapement levels.

The estimated pink salmon spawning escapement totaled about 1.7 million as compared to a desired maximum level of 1.5 million. The desired escapement was reached or exceeded in all districts except the Northern where weak returns were expected. Special regulatory measures taken did not produce the desired escapement levels in the Northern district.

The distribution of spawning pink salmon was probably the best that has been obtained in Prince William Sound in several years. Montague district, for example, had the best escapement and distribution of spawners since the pre-earthquake period. Recent post-earthquake odd-year escapements have generally been skewed to the north end of the Island, but in 1977 adequate spawning pinks were noted in all streams surveyed.

The Coghill River, which has received excessive pink salmon escapements in recent years was held to an estimated 280,000 as compared to recent escapements in excess of 500,000 in 1973 and 1975. Early action in opening the Culross Island Sub-district and Southwestern district by emergency order in late June allowed increased effort to intercept a portion of the Coghill River pink run that has been escaping the Coghill district fishery. A Coghill River pink escapement of about 100,000 is estimated to be adequate.

## CHUM SALMON

Forecast. - The preliminary forecast for the 1977 chum salmon return was a point estimate of 750,000 with a range of 430,000 to 1.1 million based upon pre-emergent fry indices similar to those used for pink salmon. (Informational Leaflet No. 171).

Total chum salmon return estimated from catch and escapement totaled 712,690 which compares very closely with the point forecast of 750,000. The percent of error is +5.63, Table 12.

Catch. - The catch for the General Districts by week for all species is shown in Table 13. Figure 15 shows the Prince William Sound catch by all gear for all districts for the past 12 year period. A catch of 394,284 chum salmon was reported taken from the General Districts which represents 69 percent of the total chums reported from the Prince William Sound Area. As expected, the majority of the catch was obtained from the northern and eastern sections of Prince William Sound with early runs making up the bulk of the catch. An abundance of late-run chums to the head of Port Fidalgo allowed two days of extended fishing along with late runs of pinks in Galena Bay. An emergency order opening on August 13 and 14 in Port Fidalgo and Valdez Arm produced a chum catch of 45,625 or about eight percent of the total area catch.

The total area catch of 394,284 compares to a ten year average catch of years fished of about 348,000 or a little better than an average catch of chums. Table 14 presents the chum salmon catch for all gear for all Prince William Sound districts from 1968 to 1977.

Table 16 shows the age composition of the 1977 chum salmon from the commercial catch to be predominantly four-year fish which is similar to other recent years.

Escapement. - Weekly aerial spawning escapement counts and periodic ground surveys were conducted throughout the season beginning in late June and terminating in early September. Estimated chum salmon escapement by district is summarized in Table 15 which also shows a comparison with desired escapement levels.

The estimated chum salmon spawning escapement was 145,150 for all districts, Table 15, with only the Northern district receiving the desired level. The Northwestern - Coghill districts had an escapement of 46,660 which is 96 percent of the desired minimum escapement, and is probably adequate. However, the other districts received poor in the Eastern district and disasterously low escapements in the Southeastern district, and the Montague district received no escapement of chums. The Montague district received little or no fishing effort which indicates no survival from the 2,930 chum escapement recorded in 1973.

The Eastern district received about 61 percent of the desired minimum chum salmon escapement in 1977. The lower than desired escapement resulted, in part, from the decision to allow fishing in Port Fidalgo by extending the season two additional days on August 13 and 14. The catch of 45,625 chum salmon from the extended season would have increased the escapement to a total of 98,825 which would be a desirable escapement level, Table 15.

Figure 15 presents a graph of both catch and escapement for all districts for the past 12 year period.

Table 14. Annual commercial salmon catch from all Prince William Sound districts, by all gear, by species, 1968 - 1977.

Year	King	Sockeye	Coho	Pink	Chum	Total
1968	1,523	121,804	11,693	2,452,168	342,939	2,930,127
1969	3,340	285,584	12,866	4,823,579	320,977	5,451,346
1970	1,031	104,169	11,485	2,809,996	230,661	3,157,342
1971	3,551	88,368	30,551	7,310,964	574,265	8,007,699
1972 <sup>1/</sup>	547	197,526	1,634	54,783	45,370	299,860
1973	2,405	124,802	1,399	2,056,878	729,839	2,915,323
1974 <sup>1/</sup>	1,590	129,366	801	448,773	83,544	669,074
1975	2,519	189,613	6,142	4,452,805	100,479	4,751,558
1976	1,044	112,809	6,171	3,018,991	370,478	3,509,493
1977	632	310,147	804	4,528,675	571,397	5,411,655

<sup>1/</sup> General purse seine season closed.



Table 15. Prince William Sound escapement estimates, 1977.

<u>Pink Salmon</u>		
District	Desired Escapement	Actual Escapement
Eastern	403,750 - 484,500	465,970
Northern	140,000 - 168,000	62,150
Coghill	] 262,500 - 315,000 [	338,750
Northwestern		87,920
Eshamy	] 112,500 - 135,000 [	32,080
Southwestern		193,980
Montague	106,250 - 127,500	196,970
Southeastern	225,000 - 270,000	315,510
TOTAL	1,250,000 - 1,500,000	1,693,330

<u>Chum Salmon</u>		
District	Desired Escapement	Actual Escapement
Eastern	87,200 - 109,000	53,200
Northern	29,400 - 36,750	36,360
Northwestern & Coghill	48,600 - 60,750	46,660
Southwestern & Eshamy	3,400 - 4,250	560
Montague	11,400 - 14,250	0
Southeastern	20,000 - 25,000	8,370
TOTAL	200,000 - 250,000	145,150

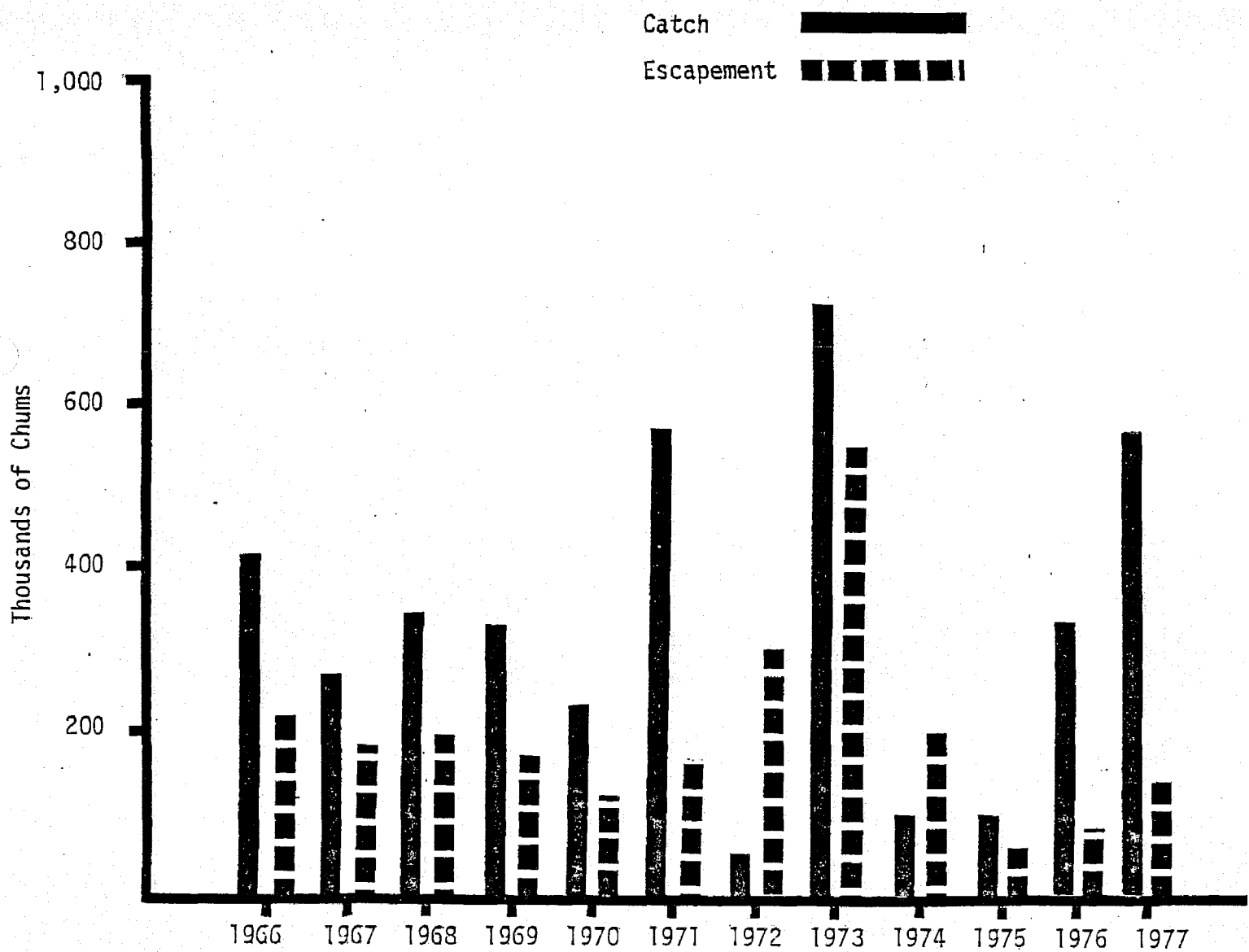


Figure 15. Prince William Sound chum salmon catch and escapement.

Table 16. Chum salmon commercial catch age composition, by sex and date, Prince William Sound, 1977.

Date and Sex	Age Group				TOTAL
	3	4	5	6	
6/19 - 7/30 <sup>1/</sup>					
Males					
Number	2,497	62,307	15,309	0	80,107
Percent	3.11	77.78	19.11	0.00	48.70
Females					
Number	1,426	71,211	11,746	0	84,383
Percent	1.69	84.39	13.92	0.00	51.30
Total					
Number	3,917	133,518	27,055	0	164,490
Percent	2.38	81.17	16.45	0.00	100.00
7/30- 7/2 <sup>2/</sup>					
Males					
Number	509	35,496	1,399	0	37,404
Percent	1.36	94.90	3.74	0.00	49.92
Females					
Number	255	35,741	1,527	0	37,523
Percent	0.68	95.25	4.07	0.00	50.08
Total					
Number	764	71,237	2,926	0	74,927
Percent	1.02	95.08	3.90	0.00	100.00
7/3 - 7/16 <sup>3/</sup>					
Males					
Number	3,151	76,885	4,203	0	84,239
Percent	3.74	91.27	4.99	0.00	45.46
Females					
Number	1,678	95,606	3,780	0	101,064
Percent	1.66	94.60	3.74	0.00	54.54
Total					
Number	4,829	172,491	7,983	0	185,303
Percent	2.61	93.08	4.31	0.00	100.00
7/17 - 7/23 <sup>2/</sup>					
Males					
Number	1,338	22,416	895	0	24,649
Percent	5.43	90.94	3.63	0.00	49.28
Females					
Number	358	24,653	358	0	25,369
Percent	1.41	97.18	1.41	0.00	50.72
Total					
Number	1,696	47,069	1,253	0	50,018
Percent	3.39	94.10	2.51	0.00	100.00

Table 16, cont. Chum salmon commercial catch age composition, by sex and date, Prince William Sound, 1977.

<u>Date and Sex</u>	<u>3</u>	<u>4</u>	<u>5</u>	<u>6</u>	<u>TOTAL</u>
7/24 - <u>2/</u>					
Males					
Number	3,972	35,948	814	0	40,734
Percent	9.75	88.25	2.00	0.00	42.15
Females					
Number	2,343	52,643	916	0	55,907
Percent	4.19	94.17	1.64	0.00	57.85
Total					
Number	6,315	88,596	1,730	0	96,641
Percent	6.53	91.68	1.79	0.00	100.00
Total Catch					
Males					
Number	11,461	233,052	22,620	0	267,133
Percent	4.29	87.24	8.47	0.00	46.75
Females					
Number	6,060	279,859	18,327	0	304,246
Percent	1.99	91.93	6.03	0.00	53.25
Total					
Number	17,521	512,911	40,947	0	571,379
Percent	3.07	89.77	7.16	0.00	100.00

1/ Coghill district only.

2/ General and Eshamy districts only.

## OTHER SALMON

Catch. - Other incidental salmon catches taken during the General Districts purse seine fishery include sockeye, coho and king. Significant catches of sockeye salmon are taken from the General District by purse seines with a recent high catch of 285,534 being taken in 1969. Table 13 shows the 1977 catch to be 104,308. Several lake systems in Prince William Sound contribute to the sockeye catch, and among the more significant sockeye producers are Coghill and Eshamy Lakes which are dealt with separately in this report.

Coho salmon are the next most abundant of the incidentally taken species with a recent high catch of 30,551 in 1970. The 1977 catch of 652 is shown in Table 13. Coho salmon are produced in numerous small stocks throughout Prince William Sound. The most notable production areas being Stream No. 19 in Simpson Bay; Stream No. 65 at Hell's Hole; and Stream No. 137, Lowe River at the head of Port Valdez.

King salmon contribute insignificant numbers in the General Districts purse seine catch with a recent high catch of 3,551 taken in 1971. Table 13 shows a 1977 catch of 449.

There are no known king salmon spawning areas in Prince William Sound, and purse seine catches generally consist of small immature kings.

Table 14 presents the king, sockeye and coho salmon catch for all gear for all Prince William Sound districts from 1963 to 1977.

Escapement. - Only sockeye salmon spawning escapements are regularly recorded from streams (lakes) in the General Districts, Table 17. Peak counts are used as the estimated spawning escapement. Since 1960 sockeye escapements into Bainbridge Lake have ranged from 100 to 2,000; in Billy's Hole Lake from 0 to 3,600; in Jackpot Lake from 300 to 7,000; in Lake Shrode from 50 to 8,000; and, in Robe Lake from 500 to 9,000, (see Data Report No. 10, 1973).

## HATCHERIES

In 1977 the Prince William Sound Aquaculture Corporation hatchery at Port San Juan was in operation. Their annual report for the year is presented as Appendix D.

Table 17. Sockeye salmon estimated spawning escapements from selected systems in Prince William Sound, 1977.

Lake	Stream No.	6/28	7/6	7/11	7/18	7/21	7/25	7/28	Total
Bainbridge	630	.				0	500		500
Billy's Hole	213	0		100					100
Jackpot	608							7,000	7,000
Shrode	476		0	200					200
Robe	137			3,500	3,000				3,500
TOTAL									11,300

1/ Peak count used as estimated escapement.

## ESHAMY DISTRICT

Introduction. - Eshamy district is located on the western mainland shore of Prince William Sound. The district includes the water within one nautical mile of the mainland shore from the outer point on the north shore of Granite Bay to the light on the south shore of the entrance to Port Nellie Juan, Figure 1.

The legal gear for the district is set gill net and drift gill net, and the fishery is managed primarily to harvest sockeye salmon returning to Eshamy Lake; however, substantial numbers of both pink and chum salmon are taken, and in many years their numbers far exceed the total catch of sockeye from the district. Historical catches of sockeye from the district have approached or exceeded 100,000 several times, although the average is considerably less, and since 1940 the catch has averaged about 36,000 sockeye.

Since statehood the management strategy has been to regulate the fishery on the basis of the counted sockeye escapement at Eshamy River weir by opening the fishery during years when parent escapements were considered adequate, and closing the district when parent escapements were low. This method of regulating the fishery has not always been successful as experienced by the 1974 fishery where a catch of 19,034 and an escapement of 633 sockeye were recorded. The reason for the unusually low ratio of escapement to catch is not known and no suspected reasons are readily apparent.

### SOCKEYE SALMON

Catch. - The Eshamy district was scheduled to open on July 11, but because of the earlier timing of salmon returning to Prince William Sound, the season was opened by emergency order on July 4. Fishing was allowed from 6:00 a.m. Monday until 9:00 p.m. Friday each week of the season until closed by emergency order on August 5. A total of 41 drift gill net and 12 set gill net (peak effort) fishermen participated in the fishery to harvest 26,546 sockeye, Table 20 and Figure 16.

Sockeye age composition from catch and escapement is presented in Table 13 which shows the majority ages to be 1.2's and 1.3's with a significant number of 2.2's.

Escapement. - The Eshamy district is managed separately from other Prince William Sound districts primarily to harvest sockeye salmon returning to the Eshamy Lake system. For many years the principal management tool has been a weir placed in Eshamy River to count sockeye returning to the lake to spawn. The weir was first placed in the river in 1931, and was operated for two years but because of budget limitations was abandoned after the 1932 season, (ADF&G Technical Data Report No. 26). Counting was initiated again in 1950 and has been an annual management tool since that time.

Sockeye escapement counts at Eshamy River weir have ranged from a high of 229,668 in 1932 to a low count of 633 sockeye in 1974. The average sockeye escapement for the past ten year period is 21,401 with a range of 68,048 to 633, Table 19 and Figure 16. The Eshamy River weir count for the 1977 season is contained in Appendix B.2.

Table 18. Eshamy District sockeye salmon commercial catch and escapement age composition by sex, Prince William Sound, 1977.

	Age Group						TOTAL
	<u>1.1</u>	<u>1.2</u>	<u>1.3</u>	<u>2.1</u>	<u>2.2</u>	<u>2.3</u>	
Commercial Catch							
Males							
Number	0	4,896	5,713	39	1,282	156	12,086
Percent	0.00	40.51	47.27	0.32	10.61	1.29	45.53
Females							
Number	0	6,064	6,648	0	1,476	272	14,460
Percent	0.00	41.94	45.97	0.00	10.21	1.83	54.47
Total							
Number	0	10,960	12,361	39	2,758	428	26,546
Percent	0.00	41.29	46.56	0.15	10.39	1.61	100.00
Escapement							
Males							
Number	49	3,209	1,283	0	529	99	5,232
Percent	0.94	61.32	24.53	0.00	11.32	1.89	44.54
Females							
Number	0	3,553	1,333	0	1,579	49	6,514
Percent	0.00	54.54	20.46	0.00	24.24	0.76	55.46
Total							
Number	49	6,762	2,616	0	2,171	148	11,746
Percent	0.42	57.57	22.27	0.00	18.48	1.26	100.00
Total Run							
Males							
Number	49	8,105	6,996	39	1,874	255	17,318
Percent	0.28	46.80	40.40	0.22	10.82	1.48	45.23
Females							
Number	0	9,617	7,981	0	3,055	321	20,974
Percent	0.00	45.35	38.05	0.00	14.57	1.53	54.77
Total							
Number	49	17,722	14,977	39	4,929	576	38,292
Percent	0.13	46.28	39.11	0.10	12.87	1.51	100.00



Table 19. Eshamy district annual salmon escapement from weir and stream foot survey counts, 1968 to 1977. 1/

Year	King	Sockeye	Coho	Pink	Chum
1968	1	68,048	450	12,030	
1969		61,196	96	12,280	
1970		11,460	25	7,420	390
1971		954	97	7,800	120
1972		28,683	71	1,510	70
1973		10,202	205	5,390	170
1974		633		6,330	
1975		1,724	41	5,720	440
1976		19,367	125	5,500	
1977		11,746	230	32,080	

1/ Number of streams surveyed varied from 3 to 5 for pink and chum salmon, (see Technical Data Report No. 35 and Data Report No. 9).

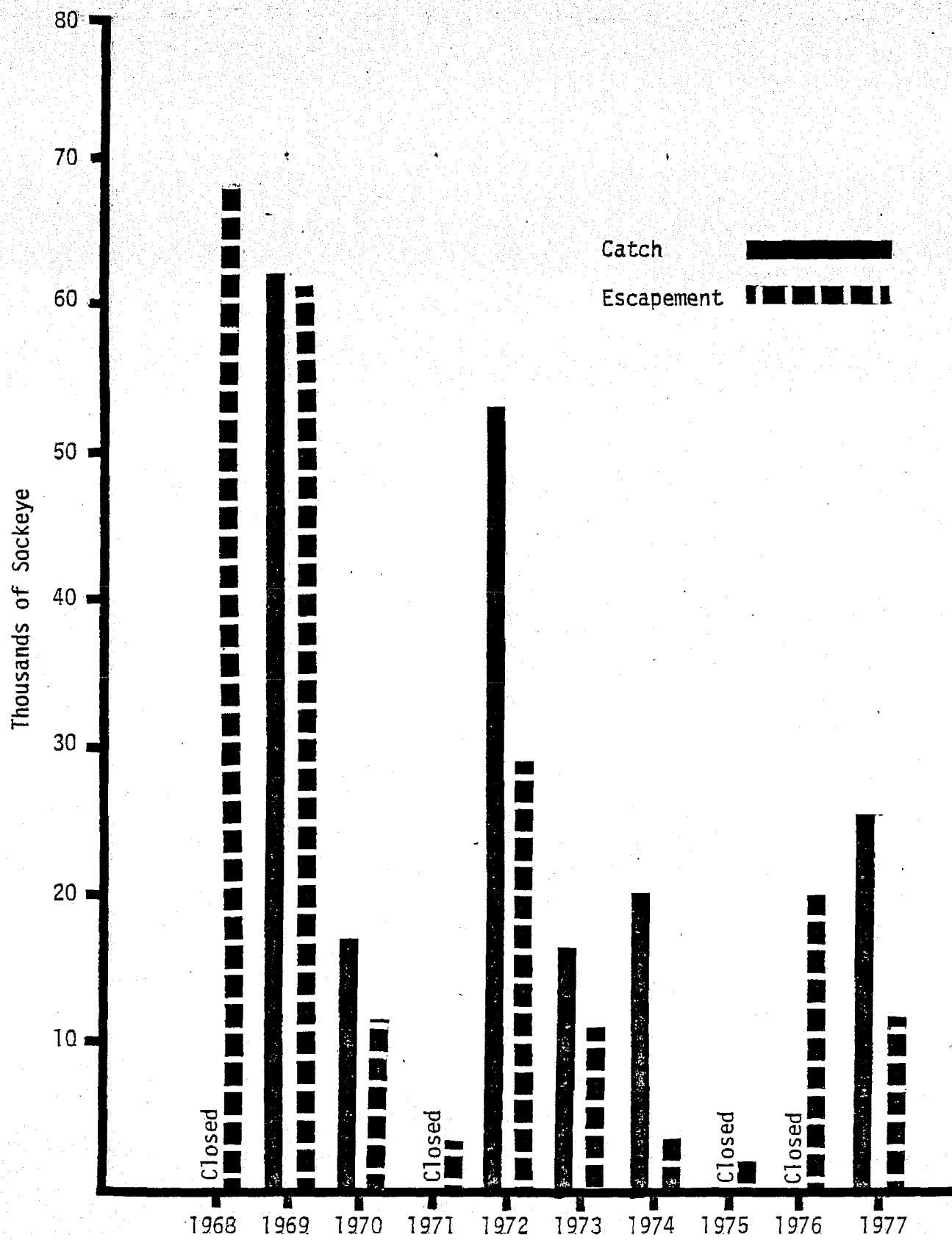


Figure 16. Eshamy district sockeye salmon catch and escapement.

## PINK SALMON

Catch. - Pink salmon are generally the most abundant species in the district catch, and the 1977 catch of 86,660 far exceeded the sockeye catch, Table 20. Pink salmon are taken incidental to the target sockeye species using standard sockeye gill nets with mesh sizes of about 5 3/8 inches which allows many of the smaller sized pinks to escape. For this reason the catch of pinks is probably not indicative of the actual numbers available.

Several small pink salmon spawning systems are located within the district, however, the major portion of the pink salmon catch probably comes from pinks traveling through the district enroute to other districts of Prince William Sound.

Escapement. - Escapement surveys are conducted on several small streams in the district in addition to the weir count and survey done in Eshamy River, (ADF&G Technical Data Report No. 35). In 1977, five streams were surveyed which produced a calculated escapement of 32,080 pink salmon. The 1977 escapement compares to 5,720 pinks calculated for the same streams in the parent year 1975, and is the largest recorded escapement during the last ten year period, Table 19.

## CHUM SALMON

Catch. - The Eshamy district chum salmon catch is made largely from interception of chums traveling through the district to other districts of Prince William Sound. Significant catches of chums are taken some years ranging from 39,909 in 1962 to 93 in 1932, (Data Report No. 26). Recent catches have averaged 17,131 during the last ten years that fishing was allowed. The 1977 catch was 4,218, Table 20.

Escapement. - Very few chum salmon spawn in the Eshamy district as indicated in Table 19. The largest escapement for the last ten years was calculated to be 440 in 1975 and no escapement of chums was recorded for five of the ten years. No chums were observed spawning in the district in 1977.

## OTHER SALMON

Catch. - Incidental catches of both king and coho salmon are taken during years the fishery is operating. The highest recorded catch of 3,895 coho was taken in 1962, and the highest recorded catch of 82 kings was taken in 1972, (Technical Data Report No. 26). A total of 51 coho and 16 kings were taken in 1977.

Escapement. - Coho salmon are known to spawn in one stream in the district, namely Eshamy River. The highest recorded escapement of 6,372 was counted at Eshamy River weir in 1932 and subsequent escapements have ranged down to a low of none being counted in 1974. A total of 230 coho were counted in the river in 1977.

King salmon do not normally spawn in Prince William Sound streams although occasional strays have been recorded at Eshamy River weir, (Technical Data Report No. 26).

Table 20. Eshamy district annual salmon catch by species and gear, 1968 to 1977.

Year	<u>Set Gill Net</u>					Peak Units of Gear
	King	Sockeye	Coho	Pink	Chum	
1968	CLOSED					
1969	13	56,785	182	22,133	7,120	23
1970	2	15,310	515	38,607	4,672	27
1971	CLOSED					
1972	33	37,771	520	25,103	10,345	11
1973	28	8,969	78	9,724	10,914	15
1974	4	6,394	11	68,300	5,408	10
1975	CLOSED					
1976	CLOSED					
1977	9	9,889	2	24,738	4,218	12
<u>Drift Gill Net</u>						
1968	CLOSED					
1969	3	4,984	29	3,327	1,016	10
1970	-	1,982	64	5,774	960	8
1971	CLOSED					
1972	49	15,117	626	20,362	15,663	53
1973	41	7,470	71	11,777	16,632	42
1974	18	12,640	114	217,141	23,488	146
1975	CLOSED					
1976	CLOSED					
1977	7	16,657	49	61,922	8,069	53
<u>All Gear</u>						
1968	CLOSED					
1969	16	61,769	211	25,460	8,136	33
1970	2	17,292	579	44,381	5,632	35
1971	CLOSED					
1972	82	52,838	1,146	45,375	26,008	64
1973	69	16,439	149	21,501	27,546	57
1974	22	19,034	125	285,441	28,896	156
1975	CLOSED					
1976	CLOSED					
1977	16	26,546	51	86,660	4,213	65

Research. - In 1977 both limnological and biological studies were conducted on Eshamy Lake in preparation for a possible lake fertilization project.

Limnological data collected consisted of 1) Dissolved oxygen, 2) Temperature profiles, 3) Secchi disc reading, 4) Lake bathymetry, 5) Water chemistry, and 6) Total dissolved solids. The biological studies consisted of 1) Plankton samples, 2) Trawling for juvenile sockeye, 3) Gillnetting to obtain samples of fish species present other than sockeye, and 4) Sockeye smolt sampling.

The programs were initiated in mid-June and terminated in late August. Sampling, other than for fish, was conducted on a bi-weekly schedule. Due to the late starting date of smolting, only nine fish were captured. Age - weight - length data was collected from these samples. Samples, for dissolved oxygen, lake temperature, secchi disc readings, plankton and water properties were taken at four standard sites, two in each arm of the lake. Times at which the samples were taken were also standardized. Juvenile sockeye, gillnetting and bathymetry samples were collected over a three day period in late August.

Of prime interest was the results of the plankton studies. Analysis of plankton samples showed a high rate of similarity in species and numbers present with Great Central Lake in British Columbia, Canada. This was the lake that, after fertilization, showed an estimated tenfold increase in sockeye production.

At the time of this writing there is a formal proposal for Eshamy Lake for fertilization and necessary associated studies.

## COGHILL AND UNAKWIK DISTRICTS

Introduction. - The Coghill district is located in the northwest corner of Prince William Sound. The district is described in the Commercial Fishing Regulations as including water within one nautical mile of Esther Island on the south shore beginning at a point on the mainland shore at 60° 49' 22" N. lat., 147° 51' W. long., all water of Esther Passage, all water of College Fjord and all water of Port Wells north of 60° 48' 30" N. lat., a boundary point to point line from Esther Rock to Pigot Point, Figure 1.

Unakwik district is located in northcentral Prince William Sound and is described in the Commercial Fishing Regulations as the waters of Unakwik Inlet north of 61° 01" N. lat.

The legal gear for both districts include both purse seines and drift gill net although drift gill nets far outnumber the purse seine gear, and in most years only gill net fishermen operate in the Unakwik district. The districts are managed separately from other Prince William Sound districts primarily to harvest sockeye salmon returning to Coghill River in the Coghill district and to Cowpen and Miners Lake in the Unakwik district. Substantial numbers of both pink and chum salmon are also taken in the Coghill district, and during recent pink salmon odd-year cycles a concerted effort has been made to manage separately the very large pink salmon runs returning to Coghill River. Very few pink and chum salmon are caught in the Unakwik district; the catch being primarily sockeye taken by drift gill nets. The catch from Unakwik district seldom exceeds 10,000 sockeye.

### SOCKEYE SALMON

Catch. - Historical catches of sockeye from the Coghill district date back to 1961 when the district was first established to manage separately the run of sockeye returning to Coghill Lake. Unakwik district was established in 1962 to manage separately the sockeye runs returning to Cowpen and Miners Lake. Sockeye catches from the Coghill district have ranged from the 1977 high catch of 162,589 to a low catch of 36,273 in 1970, Table 21 and Figure 17. The high catch of sockeye was taken in 1977 despite the fact that the weekly fishing time prior to July 1 had been reduced to four days in the Coghill district where previously fishing was allowed five days per week.

Unakwik district catches have ranged from 6,553 in 1968 to 11,922 during the past ten year period, Table 22.

Escapement. - The escapement of sockeye into the Coghill district is monitored by counting at the Coghill River weir located approximately 1.5 miles upriver from the mouth. A permanent weir was installed in Coghill River in 1974 from which total sockeye escapement into Coghill Lake can be determined. Prior to 1974 sockeye escapement was estimated using a combination weir-tower estimate and aerial surveys. Estimated sockeye escapements have ranged from 9,658 in 1970 to 80,000 in 1966. Since installation of the permanent weir in 1974 the total sockeye escapement has ranged from 9,056 in 1976 to 34,855 in 1975, Figure 17. The sockeye escapement into Coghill Lake in 1977 was 31,562 which represents about 15.5 percent of the estimated total run.

Table 23 presents the 1977 sockeye age composition for catch and escapement from the Coghill district. The predominant age in 1977 was 1.3's which is similar to past years.

Table 21. Coghill district annual salmon catch by species and gear,  
1968 to 1977. 1/

Year	<u>Purse Seine</u>					Peak Units of Gear
	King	Sockeye	Coho	Pink	Chum	
1968	109	35,255	1,000	95,068	29,213	66
1969	523	63,269	120	22,112	23,687	73
1970	100	15,547	336	66,902	8,842	40
1971	348	15,652	393	64,877	41,680	68
1972	NO FISHING					
1973	40	2,856	18	68,918	16,403	73
1974	192	4,273	22	54,268	7,720	45
1975	246	4,985	30	145,155	2,561	45
1976	83	6,159	29	56,967	30,328	111
1977	36	15,819	50	198,063	32,521	47

<u>Drift Gill Net</u>						
1968	64	40,853	219	19,108	16,863	128
1969	61	71,627	121	1,324	8,446	91
1970	4	20,726	102	6,694	5,124	80
1971	73	29,862	54	4,006	11,149	133
1972	67	134,623	296	5,961	18,503	142
1973	144	74,426	237	61,328	68,311	160
1974	156	95,610	103	98,149	51,428	212
1975	525	142,864	357	99,492	32,438	311
1976	102	54,334	72	53,219	89,170	229
1977	108	146,770	20	235,985	106,308	207

<u>All Gear</u>						
1968	173	76,108	1,219	114,176	46,076	194
1969	584	134,896	241	23,436	32,135	164
1970	104	36,273	438	73,596	13,966	120
1971	421	45,514	447	68,883	52,829	201
1972	67	134,628	296	5,961	18,503	142
1973	184	77,282	255	130,246	84,714	233
1974	348	99,883	125	152,417	59,148	257
1975	771	147,849	387	244,647	34,999	356
1976	185	60,493	101	110,186	119,498	340
1977	144	162,589	70	434,048	138,829	254

1/ Catch through week 29.

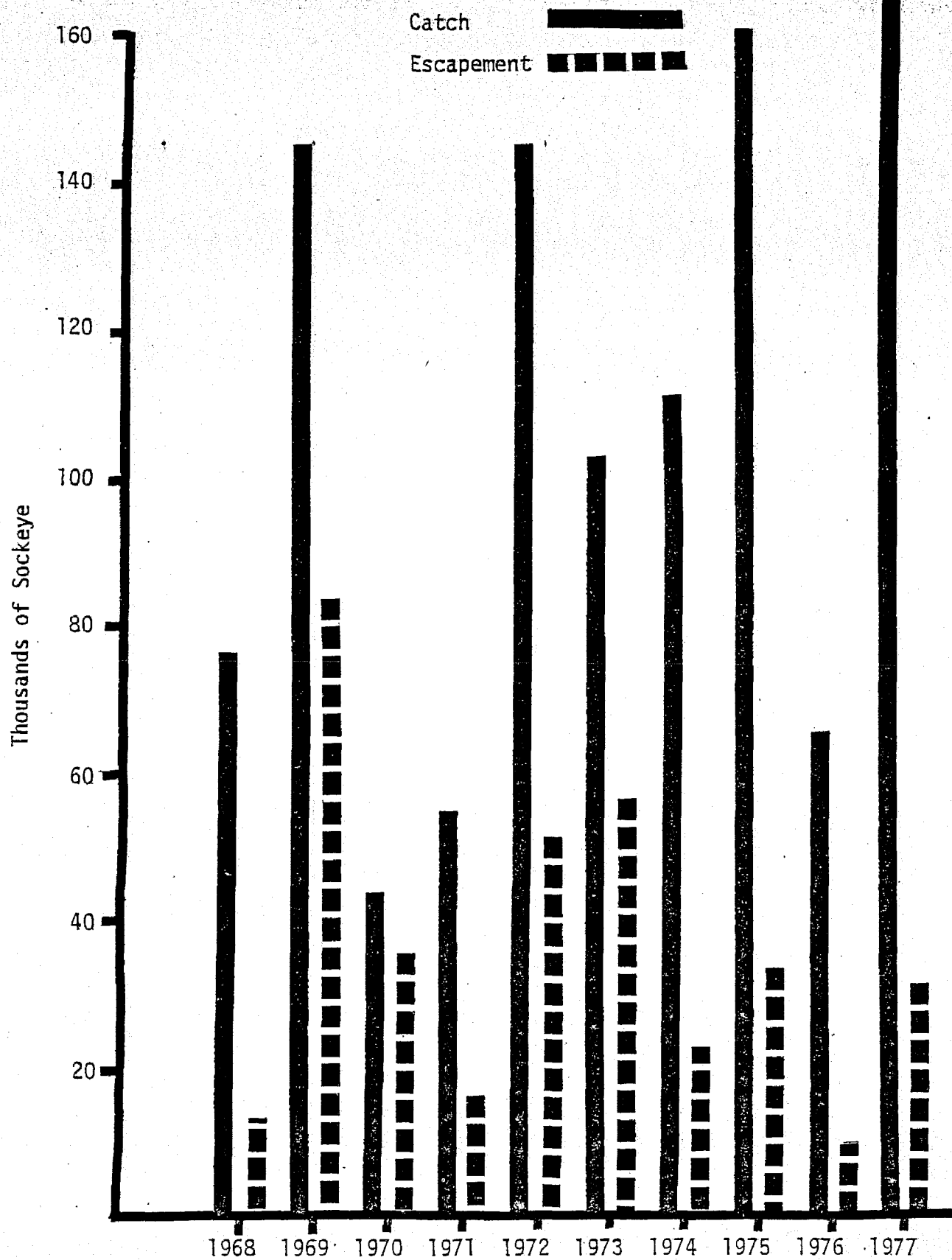


Figure 17. Coghill district sockeye salmon catch and escapement.



Table 22. Unakwik district annual salmon catch by species, by gear,  
1968 to 1977. 1/

Year	<u>Drift Gill Net</u>					Peak Units of Gear
	King	Sockeye	Coho	Pink	Chum	
1968	1	6,537	3	349	62	17
1969	-	8,351	-	9	16	9
1970	-	7,018	-	1,892	672	16
1971	-	1,470	-	111	216	6
1972	2	10,010	-	3,445	859	13
1973	1	8,858	-	119	91	12
1974	5	10,449	3	10,911	500	16
1975	4	11,922	-	84	70	14
1976	4	8,421	-	2,744	331	15
1977	3	7,912	2	257	141	16

<u>Purse Seine</u>						
1968	-	16	1	2,526	3,837	3
1969	-	-	-	8,297	743	2
1970	-	232	-	24,743	1,294	7
1971	-	38	68	14,207	1,621	6
1972	No Fishing					
1973	" "					
1974	" "					
1975	" "					
1976	-					
1977	No Fishing	7	-	8,526	225	4

<u>All Gear</u>						
1968	1	6,553	4	2,875	3,899	21
1969	-	8,351	-	8,306	759	11
1970	-	7,250	-	26,635	1,966	23
1971	-	1,508	68	14,313	1,837	12
1972	2	10,010	-	3,445	859	13
1973	1	8,858	-	119	91	12
1974	5	10,449	3	10,911	500	16
1975	4	11,922	-	84	70	14
1976	4	8,428	-	11,270	556	19
1977	3	7,912	2	257	141	16

1/ Catch through week 29.

Table 23. Coghill District sockeye salmon commercial catch and escapement age composition by sex, Prince William Sound, 1977.

	Age Group					
	<u>1.1</u>	<u>1.2</u>	<u>1.3</u>	<u>2.2</u>	<u>2.3</u>	<u>TOTAL</u>
Commercial Catch						
Males						
Number	399	13,460	66,503	2,005	2,609	84,976
Percent	0.47	15.84	78.26	2.36	3.07	47.53
Females						
Number	0	11,051	75,928	4,015	2,814	93,803
Percent	0.00	11.78	80.94	4.28	3.00	52.47
Total						
Number	399	24,511	142,431	6,020	5,423	178,784
Percent	0.22	13.71	79.67	3.37	3.03	100.00
Escapement						
Males						
Number	0	1,874	19,868	111	455	22,308
Percent	0.00	8.40	89.06	0.50	2.04	70.68
Females						
Number	0	965	8,232	0	57	9,254
Percent	0.00	10.43	88.96	0.00	0.61	29.32
Total						
Number	0	2,839	28,100	111	512	31,562
Percent	0.00	8.99	89.04	0.35	1.62	100.00
Total Return						
Males						
Number	399	15,334	86,371	2,116	3,064	107,284
Percent	0.37	14.29	80.51	1.97	2.86	51.00
Females						
Number	0	12,016	84,160	4,015	2,871	103,062
Percent	0.00	11.66	81.66	3.90	2.78	49.00
Total						
Number	399	27,350	170,531	6,131	5,935	210,346
Percent	0.19	13.00	81.08	2.91	2.82	100.00

Coghill River weir station weather data for 1977 is presented in Appendix C.1. Appendix C.2. shows the daily sockeye salmon weir count in 1977.

Periodic aerial surveys of spawning sockeye have been made in Miners Lake and Cowpen Lake (see Data Report No. 10).

#### PINK SALMON

Catch. - The Coghill district has several pink salmon producing streams with Coghill River being the major producer particularly during the odd-year cycle. The 1977 catch of 434,048 pinks, Table 21, was the largest pink catch recorded from the district since inception of the fishery in 1961, although direct comparisons of district catches for all years cannot be made since the Coghill district was enlarged in 1976 to include the western one-half of Port Wells.

Additional fishing effort was encouraged in 1977 in anticipation of a large Coghill River pink salmon return by allowing fishing in the Culross Island subdistrict and in the Southwestern district by emergency order early in the season. The purpose of opening these areas early was to intercept Coghill River bound pink salmon and help reduce excessive escapement of pinks experienced in other recent odd years. Also, on July 4 after the sockeye escapement was assured, fishing was allowed up to the mouth of Coghill River for the remainder of the season. In 1975 fishing was also allowed in the Culross Island subdistrict on July 1 and to the mouth of Coghill River after July 17, but that year excessive pink escapements occurred despite the increased fishing area.

Escapement. - The Coghill district contains 13 pink salmon spawning streams that are regularly surveyed by air, and seven of these by foot surveys. These 13 pink streams comprise most of the known pink spawning streams of the district (Technical Data Report No. 35) and are used to calculate the annual escapement.

Table 24 shows the 1977 district escapement of 387,310 pink salmon and both odd and even year pink escapements since 1968. Coghill River is the major pink producer of the district, and in recent odd year cycles has produced tremendously large returns that have significantly influenced both catch and escapement for all of Prince William Sound.

Unlike most fisheries in Prince William Sound that require protection to obtain adequate pink escapements, the Coghill River system, during the past four cycles, has received more than the maximum desired pinks, and the problem has been lack of adequate harvest. The 1977 pink escapement was significantly reduced by in-season adjustments by emergency order to allow maximum utilization of the returning pink run. The result was a pink escapement of about 300,000 which was significantly reduced from the past three cycle years.

Chum Salmon. - The Coghill district is a significant producer of chum salmon although the fishery probably intercepts stocks of chums enroute to the Northern and Eastern district, and to a lesser degree, those headed for the Northwestern district. Coghill River again is the major chum salmon stream in the district and contributes about 90 percent of the chums. Since 1968 the district chum catch has ranged from 13,966 in 1970 to a high of 138,829 in 1976, Table 21. The 1977 catch is the highest catch for the ten year period.

Table 24. Coghill district annual salmon escapement by species and gear, 1968 to 1977.

Year	Sockeye	Pink <u>4/</u>	Chum <u>4/</u>
1968	11,800 <u>1/</u>	104,340	22,950
1969	10,142 <u>1/</u>	114,520	37,700
1970	9,658 <u>1/</u>	80,060	17,330
1971	15,000 <u>2/</u>	526,950	15,450
1972	16,392 <u>1/</u>	24,050	25,890
1973	13,281 <u>1/</u>	561,200	78,810
1974	22,333 <u>3/</u>	42,660	39,700
1975	34,855 <u>3/</u>	570,950	7,100
1976	9,056 <u>3/</u>	50,930	35,750
1977	31,562 <u>3/</u>	387,310	41,640

1/ Weir-tower estimates.

2/ Aerial count.

3/ Total weir count.

4/ From 1968 through 1975 the district totals have been adjusted to include the west side of Port Wells.

Escapement. - The Coghill district has seven chum salmon spawning streams that are regularly monitored for escapement. The surveyed streams are the only known spawning areas in the district and are used to calculate the annual district chum salmon escapement.

During the ten year period beginning in 1968 the Coghill district chum salmon escapement has ranged from 7,100 in 1975 to a high of 73,810 in 1973. The 1977 chum escapement was calculated to be 41,640, Table 24.

#### OTHER SALMON

Catch. - Small numbers of both king and coho salmon are taken each year in the Coghill district primarily. Feeder populations of king salmon are taken incidental to the target species. Table 21 shows a high king catch of 771 since 1968. The 1977 catch of 167 is the second lowest catch for the ten year period.

Some coho stocks are indigenous to the Coghill district as indicated by casual observations, but none are known to occur in the Unakwik district.

Table 21 shows the Coghill district catch of coho from 1968 to 1977. Coho catches have ranged from 70 in 1977 to a high catch of 1,219 in 1971.

Escapement. - Coho are known to spawn in Coghill River system and have been reported in the streams at the head of Pigot Bay. No other spawning areas are known although small numbers probably spawn in other streams in the districts.

No king salmon spawning areas are known in Prince William Sound.

## PROCESSORS

In 1977 four major canneries and four smaller operations processed salmon in the Prince William Sound Area. Two of the major operators custom processed salmon for two other companies. Four buyers purchased salmon for processing in areas outside of Prince William Sound. Three major and three minor companies processed king, Dungeness and Tanner crab. Herring sac roe was processed by eight companies, and ten operators processed herring spawn on kelp. Approximately 42 tons of bottom fish, used mainly for bait, and 78 tons of halibut were caught in the area. Minor amounts of shrimp and razor clams were also harvested.

A sequential listing of fish and shellfish processors, location of operation, size of cans, lines of machinery and type of product processed in 1977 is presented in Appendix A.

Table 25 gives the 1977 salmon case pack and frozen production by species, by week, for the Prince William Sound Area.

The average price paid per pound for salmon, shellfish and miscellaneous fish harvested in the Prince William Sound Area in 1977 is recorded in Table 26.

Table 25. Prince William Sound Area case pack and pounds of frozen salmon by species, by week, 1977. 1/

Week	<u>Kings</u>		<u>Sockeye</u>		<u>Cohos</u>		<u>Pinks</u>		<u>Chums</u>	
	Pounds Frozen	Cases	Pounds Frozen	Cases	Pounds Frozen	Cases	Pounds Frozen	Cases	Pounds Frozen	Cases
21	77457	21	345496	1753					366	1
22	66795	78	344340	5735						2
23	107161	83	411507	9501						23
24	49905	54	236426	1395						
25	33224	7	223116	2534			4686	126		4
26	15300	7	428081	3364		5	1674	752	18011	2198
27	2122		222740	6983			238541	28477	137303	6923
28	1178		226004	3298		40	229753	24598	273130	9005
29	2191		183226	4343		216	243177	33868	222767	11586
30	1034		60765	1287		197	268004	38715	144125	2985
31	125		34880	1002	8880	199	180286	35270	86082	1833
32	20	3	9050	554	7605	236	32435	6251	12780	681
33			14580	28	8680	6	34605	542	10487	41
34	25		145	53	67820	222		9536	26815	3563
35	30		38	19	115509	183	43	16		
36					276935	305	16			
37					196391	370				
38			272	6	179941	441	496		45	
<hr/>										
TOTAL	356567	253	2741166	41360	861761	2420	1232766	178151	931911	38850

1/ From reports of processors. Frozen salmon reported in frozen weight, and cases on a basis of 48 one pound cans. Includes 131,667 pounds of frozen sockeye; 2,864 cases of sockeye, 46 coho, 3,220 pink and 321 chum salmon imported from other areas.

Table 26. Average price paid per pound for salmon, shellfish and miscellaneous fish in the Prince William Sound Area, 1977. 1/

<u>Salmon</u>				
<u>King</u>	<u>Sockeye</u>	<u>Coho</u> <sup>2/</sup>	<u>Pink</u> <sup>3/</sup>	<u>Chum</u> <sup>3/</sup>
\$1.40	\$ .97	\$ .37 - \$ .70	\$ .3575	\$ .3992
<u>Crab</u>				
<u>King</u>	<u>Dungeness</u>		<u>Tanner</u>	
\$1.35	\$ .30		\$ .33	
<u>Miscellaneous</u>				
<u>Shrimp</u>	<u>Razor Clams</u>	<u>Halibut</u>	<u>Bottom Fish (bait</u>	
\$ .135	\$ .75	\$1.15	\$ .30	

1/ From Annual Reports of Operators.

2/ The average price paid for cohos caught in Prince William Sound was \$ .37. The price paid for Copper River - Bering River fish was \$ .70.

3/ The sliding scale percentage paid after sale of the salmon pack was: pink, .0167; and chum, .0281.



## MISCELLANEOUS

Introduction. - Each year miscellaneous data is gathered on the commercial fisheries of the Prince William Sound Area that is not related specifically to any particular fishery. Items of this nature are discussed briefly in this section.

Commercial License Sales. - Commercial license sales in 1977 compare almost exactly with the sales reported in 1976. In 1977 total sales increased by the small margin of \$208 although types of licenses did vary considerably, Table 27. Types of licenses showing increases included vessel, drift gill net, set gill net, clam shovel, shellfish pots and long line. All other types of licenses showed decreases from 1976.

Calendar Weeks. - The 1977 calendar of weeks presented in Table 28 was used in reporting catch statistics from 1977 salmon landings. The calendar weeks are presented here as a reference for the several tables used in the report that list catches by week.

Economic Conditions. - A fair to good economic condition exists at the present time as indicated by the continuing trend of upgrading of the area's fishing fleet and the recent addition of several new fishing vessels. The fishing fleet is continuing to diversify by engaging in several fisheries instead of primarily salmon. Prices for all items continued to climb in 1977 and reflect the national inflationary trend which, in part, has caused the processors of salmon to shift more and more to frozen products which require less labor and demand higher prices.

The overall economic view for 1977 was a substantial gain to fishermen over 1976 due primarily to the increased salmon catches and increases in price per pound for all salmon except pinks. Prevailing per pound prices paid to fishermen began at - kings, \$1.25; sockeye, \$0.85; coho, \$0.70 (Copper-Bering River districts), \$0.39 (Prince William Sound); pink, \$0.41 (cash) and \$0.3573 (sliding scale); and, chum, \$0.46 (cash) and \$0.3992 when prices were first settled. As the season progressed and buying became more competitive the prices escalated to \$1.60 for king and \$1.07 per pound for sockeye. The average prices paid for salmon, shellfish and miscellaneous fish is shown in Table 26.

Table 27. Summary of commercial fishing licenses and receipts, 1977.

Type of Licenses	No. Licenses Issued		Total Issued	Value		Total Value
	Resident	Nonresident		Resident	Nonresident	
Commercial	1242	654	1396	\$12,420	\$19,620	\$32,040
Vessel	754*	209	963	7,533	6,270	13,803
Drift Gill Net	404	143	547	6,060	6,435	12,495
Set Gill Net	20	6	26	300	270	570
Purse Seine	213	55	267	10,660	8,250	13,910
Clam Shovel	90	4	94	450	60	510
Shellfish Pots	96	11	107	1,830	945	2,775
100 pots	(81)	(06)	(87)	(1,215)	(270)	(1,485)
200 pots	(09)	(03)	(12)	(270)	(270)	(540)
300 pots	(04)	(01)	(05)	(180)	(135)	(315)
500 pots	(01)		(01)	(75)		(75)
600 pots	(01)	(01)	(02)	(90)	(270)	(360)
Troll	7	0	7	105		105
Long Line	108	8	116	2,700	400	3,100
Otter Trawl	3	0	3	150		150
Beam Trawl	4	0	4	200		200
Total	2941	1090	4031	\$42,408	\$42,250	\$84,658

\* Includes one small vessel operator license; resident @ \$3.00.

Table 28. Calendar weeks used in reporting catch statistics from 1977 landings.

<u>Week</u>	<u>From</u>	<u>Thru</u>	<u>Week</u>	<u>From</u>	<u>Thru</u>
1	Jan. 1	Jan. 1	28	July 3	July 9
2	2	8.	29	10	16
3	9	15	30	17	23
4	16	22	31	24	30
5	23	29	32	31	Aug. 6
6	30	Feb. 5	33	Aug. 7	13
7	Feb. 6	12	34	14	20
8	13	19	35	21	27
9	20	26	36	28	Sept. 3
10	27	March 5	37	Sept. 4	10
11	March 6	12	38	11	17
12	13	19	39	18	24
13	20	26	40	25	Oct. 1
14	27	April 2	41	Oct. 2	8
15	April 3	9	42	9	15
16	10	16	43	16	22
17	17	23	44	23	29
18	24	30	45	30	Nov. 5
19	May 1	7	46	Nov. 6	12
20	8	14	47	13	19
21	15	21	48	20	26
22	22	28	49	27	Dec. 3
23	29	June 4	50	Dec. 4	10
24	June 5	11	51	11	17
25	12	18	52	18	24
26	19	25	53	25	31
27	26	July 2			

Appendix A. A sequential listing of fish and shellfish processors, location of operation, size of cans, lines of machinery and type of product processed for 1977.

Name, Executive, Address Location of Operation	Size of Cans Lines of Machinery	Type of Product
Alaska Packers Association 1/ Merle Wickett, Superintendent P. O. Box 380 Cordova		Salmon
William Baker M/V Starburst Cordova		Herring Spawn on Kelp
Bayside Cold Storage, Inc. Fred Pettingill, Supt. P. O. Box 636 Cordova		Salmon, Herring Sac Roe, Halibut
* B & B Fisheries Allen Searle, President P. O. Box 2367 Kodiak		Herring Sac Roe
Bergit Fish Company Stanley Samuelson, Owner P. O. Box 936 Cordova		Herring Spawn on Kelp
Blake's Canning Margaret Blake, Supt. P. O. Box 94 Cordova	6 1/2 oz. Hand Pack	Salmon
* Fairmount Island Seafoods L. D. Wooldridge, Owner 1020 M. Street Anchorage		Herring Spawn on Kelp
Fairmount Island Seafoods David Owings, Owner 4540 Edinburgh Drive Anchorage		King and Tanner Crab, Frozen
* The Fish Company P. O. Box 1227 Valdez		Salmon, Herring (bait), King and Tanner Crab
Glacier Packing Company Percy Conrad, Owner P. O. Box 176 Cordova	6 1/2 oz., smoked 7 1/2 oz., plain	Salmon

## Appendix A., cont.

Name, Executive, Address Location of Operation	Size of Cans Lines of Machinery	Type of Product
Johnson Fish Company Eric Johnson, Owner P. O. Box 460 Cordova		Bottomfish (bait)
* Kodiak King Crab Howard Anderson, Supt. P. O. Box 1457 Kodiak		Herring Sac Roe
* H. R. W. Glacier King Emmett Roetman, Pres. 720 W 82nd Avenue Anchorage		Salmon
MSP Company C. Ross Mullins, President P. O. Box 1249 Cordova		Herring Spawn on Kelp
* William Maness P. O. Box 394 Seward, AK		Shrimp
* Uasuo Murooka P. O. Box 4184 Pioneer Square Seattle		Herring Spawn on Kelp
Morpac, Inc. 2/ Jim Forsell, Supt. P. O. Box 120 Cordova	1 Line - 7 3/4 oz. 1 Line - 15 1/2 oz.	Salmon, Salmon Roe, Herring Sac Roe & bait, Dungeness & Tanner Crab
New England Fish Company 3/ P. O. Box 120 Cordova	1 Line - 4 oz. 2 Lines - 8 oz. 2 Lines - 1 lb.	Salmon, Herring Spawn on Kelp
* Richard Newby 2510 Aspen Drive Anchorage		Herring Spawn on Kelp
North Coast Seafood Processors James Nagai, Manager P. O. Box 1262 Cordova		Herring Sac Roe, Herring Spawn on Kelp
North Pacific Processors Ken Roemhildt, Supt. P. O. Box 1040 Cordova	1 Line - 4 oz. 1 Line - 8 oz. 1 Line - 1 lb.	Salmon, King, Dungeness Tanner Crab, Halibut, Bottom Fish & Razor Clams (for bait)

## Appendix A., cont.

Name, Executive, Address Location of Operation	Size of Cans Lines of Machinery	Type of Product
* Nuka Point Fisheries Emil Nelson P. O. Box 1113 Homer		Herring Sac Roe
* M/V Ocean Champion, Inc. L. N. Whaley, President 18019 NE 12th Place Bellevue, WA		Salmon
Odiak Smokeries Jean Dettinger, Supt. P. O. Box 153 Cordova	1 Line 1/4 lb. hand pack 1/2 lb. hand pack	Salmon (Smoked)
Pelican Cold Storage ATCO Seafoods, Inc. M/V Priscilla Ann P. O. Box 5538 Seattle		Salmon
* Salamatoof Seafoods, Inc. Tom Waterer, President P. O. Box 1045 Kenai		Herring Sac Roe
St. Elias Ocean Products <sup>4/</sup> Jim Poor, Supt. P. O. Box 548 Cordova	1 Line - 4 oz. 1 Line - 8 oz. 1 Line - 4 lb.	Salmon, Salmon Roe, King, Tanner & Dungeness Crab, Halibut, Razor Clams (bait)
* Seafoods of Alaska 606 West Northern Lights Blvd. Anchorage		King Crab
* R - Lee Seafoods, Inc. P. O. Box 3171 Kenai		Herring Sac Roe
Taylor Aquatic Enterprise Gary Taylor, Owner P. O. Box 131 Cordova		Herring Spawn on Kelp
Connie Taylor P. O. Box 969 Cordova		Shrimp, Bottom Fish (bait)
Thorne - Smith Company Ina Thorne, Secretary P. O. Box 842 Cordova		Herring Sac Roe, Herring Spawn on Kelp

## Appendix A, cont.

Name, Executive, Address Location of Operation	Size of Cans Lines of Machinery	Type of Product
Whitney - Fidalgo Seafoods <sup>3/</sup> , <sup>4/</sup> , <sup>6/</sup> Al O'Leary, Supt. P. O. Box 670 Cordova		Herring Sac Roe, Herring Spaw on Kelp, Salmon, Salmon Roe, Halibut, Bottom Fish

- 1/ New England Fish Company and Seward Fisheries custom packed salmon for Alaska Packers Association.
  - 2/ Morpac, Inc. froze and canned some salmon for St. Elias Ocean Products.
  - 3/ New England Fish Company custom packed salmon for Alaska Packers Association, Seward Fisheries and Whitney - Fidalgo Seafoods.
  - 4/ St. Elias Ocean Products custom packed salmon for Whitney - Fidalgo and Morpac, Inc.
  - 5/ Seward Fisheries custom packed salmon for New England Fish Company.
  - 6/ St. Elias Ocean Products, New England Fish Company and Morpac, Inc. custom packed salmon for Whitney - Fidalgo Seafoods. Herring sac roe was processed on the M/V Mokuhana and at Port Graham. Herring spawn on kelp was processed by Steve Smith. Halibut and bottom fish were processed in Whittier.
- \* No Annual Operator Report received.

Appendix B.1. Eshamy River weir station weather data, 1977.

Date	Air Temp. 1/		Water Temp. 2/ 3/	General Weather	Precipitation
	Max.	Min. 1/			
6/10	54	55	49	54 4 Overcast	T
11	51	54	50	54 4 Overcast	R
12	54	55	50	54 4 Overcast	R
13	59	60	49	54 3 Broken Clouds	
14	54	55	50	54 4 Overcast	T
15	56	57	51	55 4 Overcast	T
16	52	53	51	53* 4 Overcast	R
17	50	53	51	4 Overcast	R
18	51	52	49	4 Overcast	T
19	57	57	46	4 Overcast	
20	52	53	51	4 Overcast	T
21	53	55	49	4 Overcast	T
22	53	55	49	12 4 Overcast	T
23	53	55	50	12.5 4 Overcast	T
24	59	60	49	14 2 Scattered Clouds	
25	54	55	49	14 4 Overcast	T
26	61	65	53	14.5 3 Broken Clouds	
27	58	60	55	14.5 3 Broken Clouds	
28	62	63	48	13.5 1 Clear	
29	58		54	15 4 Overcast	
30	68	72	51	15 2 Scattered Clouds	
7/ 1	72	72	54	15.5 1 Clear	
2	62	65	51	17 3 Broken Clouds	
3	53	59	51	16.5 4 Overcast	
4	53	58	49	16 4 Overcast	
5	54	56	50	16 4 Overcast	
6	55	57	50	16 4 Overcast	
7	61	62	52	16 3 Bkn - Scattered Clouds 2	
8	62	63	49	16.5 1 Clear	
9	65	65	49	16.5 1 Clear	
10	70	70	53	17 2 Sctrd Clouds to Clear	
11	69	70	56	17 1 Clear	
12	62	64	55	18 2 Broken Clouds	
13	56	57	58	18 4 Overcast	
14	59	59	54	18 4 Overcast	
15	58	60	50	17 3 Broken Clouds	
16	67	72	50	17.5 1 Clear	
17	66	66	52	18 2 Scattered Clouds	
18	64	68	51	18 3 Broken Clouds	
19	56	61	56	18.5 4 Overcast	T
20	56	59	55	18* 4 Overcast	
21	55	56	55	4 Overcast	R
22	54	56	52	4 Overcast	R
23	58	59	54	4 Ovc. to Sct. Clouds 2	T
24	59	61	54	4 Overcast	
25	58	58	56	4 Overcast	T
26	56	58	56	4 Overcast	R
27	55	57	54	4 Overcast	T
28	65	67	53	1 Clear 4	
29	64	65	56	1 Clr to Overcast	
30	57	57	53	4 Overcast	T
31	56	59	56	4 Overcast	T



## Appendix B.I., cont. Eshamy River weir station weather data, 1977.

Date	Air Temp. <sup>1/</sup>	Air Temp.		Water Temp. <sup>2/, 3/</sup>	General Weather	Precipitation
		Max.	Min. <sup>1/</sup>			
8/ 1	58	59	54	4	Overcast	T
2	56	56	53	4	Overcast	R
3	56	58	54	4	Overcast	R
4	59	59	56	4	Overcast	T
5	58	59	54	4	Overcast	
6	55	60	51	3	Broken Clouds	T
7	54	56	53	4	Overcast	R
8	55	56	54	4	Overcast	R
9	55	56	55	4	Overcast	R
10	56	58	55	4	Overcast	
11	55	56	54	4	Overcast	T
12	55	57	50	4	Overcast	T
13	59	60	51	4	Overcast	T
14	57	58	57	4	Overcast	T
15	59	58	54	4	Overcast	
16	60	60	51	2	Scattered Clouds	
17	58	59	56	4	Overcast	
18	59	60	56	4	Overcast	
19	63	63	55	2	Scattered Clouds	
20	67	71	53	1	Clear	
21	67	71	55	1	Clear	
22	59	59	55	4	Overcast	T
23	61	61	56	4	Overcast	
24	58	58	53	4	Overcast	
25	58	59	55	4	Overcast	
26	56	58	52	4	Overcast	
27	57	58	53	4	Overcast	T
28	62	62	50	1	Clear	
29	60	60	49	1	Clear	
30	58	60	48	1	Clear	
31	57	57	50	4	Overcast	
9/ 1	58	60	51	1	Clear	
2	59	62	47	1	Clear	
3	59	60	47	1	Clear	
4	60	65	48	1	Clear	
5			47	4	Overcast	
6	50	57	52	4	Overcast	RR
7	49	52	48	4	Overcast	R!!
8	50	53	49	4	Overcast	R
9	52	53	51	4	Overcast	R
10	54	54	51	4	Overcast	R
11	56	59	54	4	Overcast	
12	55	65	46	1	Clear	
13	54	56	46	4	Overcast	
14	53	56	50	4	Overcast to Sct. Clouds <sup>2</sup>	
15	49	56	45	4	Overcast	R

1/ Temperatures in degrees Fahrenheit taken at 1700 hours.

2/ Temperatures through 6/16 in degrees Fahrenheit. From 6/22 on temperatures in degrees Centigrade.

3/ Water temperature taken at the weir at 0800.

\* Thermometer broken.

## Appendix B.2. Eshamy River daily weir count, 1977.

Date	Sockeye Salmon Daily Count Adult	Jack <sup>1/</sup>	Daily Total	Weekly Total	Cumulative Total
6/10	weir complete				
15	20		20		20
16	57		57		77
17	35		35		112
18	11		11		123
19	147		147		270
20	54	2	56		326
21	116	2	118	444	444
22	82		82		526
23	125	4	129		655
24	63	5	68		723
25	31	1	32		755
26	112		112		867
27	187	4	191		1058
28	101	2	103	717	1161
29	148	5	153		1314
30	222	1	223		1537
7/ 1	54	2	56		1593
2	61	2	63		1656
3	14	1	15		1671
4	70		70		1741
5	102	1	103	683	1844
6	112		112		1956
7	3		3		1959
8	2		2		1961
9	19		19		1980
10	14		14		1994
11	34		34		2028
12	5		5	189	2033
13	0		0		2033
14	0		0		2033
15	0		0		2033
16	4		4		2037
17	41	1	42		2079
18	7		7		2086
19	5		5		2091
20	7		7		2098
21	0		0		2098
22	19		19		2117
23	65		65		2182
24	30		30		2212
25	75	1	76		2288
26	36	1	37	234	2325
27	79	2	81		2406
28	76		76		2482
29	10		10		2492
30	116	4	120		2612
31	3		3		2615
8/ 1	15		15		2630
2	176	4	180	485	2810
3	101	3	104		2914
4	173	8	181		3095

## Appendix B.2., cont. Eshamy River daily weir count, 1977.

Date	Sockeye Salmon		Daily Total	Weekly Total	Cumulative Total
	Daily Adult	Count Jack <sup>1/</sup>			
8/ 5	23		23		3118
6	113	2	115		3233
7	75	6	81		3314
8	1013	23	1036		4350
9	543	4	547	2087	4897
10	209		209		5106
11	658	11	669		5775
12	327	4	331		6106
13	543	15	558		6664
14	369	13	382		7046
15	868	42	910		7956
16	368	23	391	3450	8347
17	343	17	360		8707
18	390	15	405		9112
19	281	22	303		9415
20	128	16	144		9559
21	219	14	233		9792
22	164	18	182		9974
23	349	28	377	2004	10351
24	277	19	296		10647
25	302	35	337		10984
26	131	12	143		11127
27	105	12	117		11244
28	48	4	52		11296
29	36	3	39		11335
30	59	4	63	1047	11398
31	26	4	30		11428
9/ 1	15	4	19		11447
2	14	1	15		11462
3	20	3	23		11485
4	4		4		11489
5	2		2		11491
6	0		0	93	11491
7	100	4	104		11595
8	34	3	37		11632
9	3		3		11635
10	62		62		11697
11	22		22		11719
12	11	1	12		11731
13	15		15	255	11746
14	weir pulled				
<hr/>					
TOTAL	11303	438			

<sup>1/</sup> Sockeye less than 560 mm. from tip of nose to fork of tail.

## Appendix C.1. Coghill River weir station data, 1977.

Date	Air Temp. <u>1/</u>	Air Temp. Max. Min. <u>1/</u>	Water Temp. <u>1/</u> , <u>2/</u>	General Weather	Precipitation
6/ 9	60	61 40	48	Broken Clouds	
10	63	65 42	48	Overcast	
11	59	63 47	50	Overcast	
12	59	64 43	48	Broken Clouds	
13	62	66 40	48	Clear	
14	59	62 42	52	Overcast	
15	57	61 44	50	Overcast	R
16	55	57 46	52	Overcast	R
17	55	56 47	54	Overcast	R
18	55	56 44	52	Overcast	T
19	63	61? 36	52	Broken Clouds	
20	55	60 41	50	Overcast	R
21	57	60 43	51	Overcast	
22	55	58 42	50	Overcast	
23	55	57 45	50	Overcast	T
24	65	66 45	52	Clear	
25	58	61 49	51	Overcast	
26	67	67 45	51	Scattered Clouds	
27	62	64 49	51	Overcast	
28	68	69 39	53	Clear	
29	61	64 48	52	Overcast	T
30	68	70 38	51	Broken Clouds	
7/ 1	70	73 41	54	Clear	
2	66	69 48	54	Overcast	T
3	62	66 42	54	Broken Clouds	R
4	60	61 42	52	Overcast	R
5	55	56 46	52	Overcast	R
6	62	64 45	54	Overcast	
7	66	67 34	52	Clear	
8	67	70 34	53	Clear	
9	71	73 37	55	Clear	
10	72	76 40	54	Clear	
11	71	76 41	58	Clear	
12	68	71 40	54	Clear	
13	58	67 52	53	Overcast	R
14	57	48	53	Overcast	R

1/ Temperature in degrees Fahrenheit.2/ Water temperature taken at the weir at 0800 hours.

## Appendix C.2. Coghill River daily sockeye salmon weir count, 1977.

Date	Sockeye Salmon Daily Count		Daily Total	Weekly Total	Cumulative Total
	Adult	Jack <sup>1/</sup>			
6/ 9	weir installed and complete				
10	10		10	10	10
13	22		22		32
14	404	3	407		439
15	590	4	594		1033
16	464		464		1497
17	19		19		1516
18	5		5		1521
19	56		56	1567	1577
20	1331	11	1342		2919
21	443	6	449		3368
22	657	8	665		4033
23	1244	6	1250		5283
24	1111		1111		6394
25	3039		3039		9433
26	3708		3708	11564	13141
27	7036		7036		20177
28	1710		1710		21887
29	1620		1620		23507
30	200		200		23707
7/ 1	834	1	835		24542
2	981	1	982		25524
3	1515	1	1516	13899	27040
4	2298	2	2300		29340
5	404		404		29744
6	262		262		30006
7	116		116		30122
8	122		122		30244
9	297		297		30541
10	349		349	3850	30890
11	411	4	415		31305
12	179		179		31484
13	70		70		31554
14 <sup>2/</sup>	8		8	672	31562
TOTAL	31515	47			

<sup>1/</sup> Sockeye less than 560 mm. from tip of nose to fork of tail.

<sup>2/</sup> Weir pulled.

PRINCE WILLIAM SOUND AQUACULTURE CORPORATION  
Cordova, Alaska

Annual Hatchery Operations Report to the Commissioner,  
Alaska Department of Fish and Game  
For Port San Juan Hatchery  
Year Ending June 15, 1977

I. Abstract

The first normal year of operations at Port San Juan hatchery is reported upon. While construction of facilities will not be complete until 1978, most of the components required for fish operations were functional prior to the 1976 egg-take. The first egg take from wild stocks at the hatchery stream in 1976 yielded 704,626 pink salmon eggs. An intensive remote egg take at Galena Bay, Valdez Arm yielded 14,301,792 pink and 17,112 chum eggs. The hatchery operated at 57 percent of its rated 20 million eyed-egg (Astroturf) capacity. An unusually mild winter with high rainfall occurred in 1976-1977; hatchery water supplies were plentiful and no recycling was required. When fry outmigration is completed in mid-June, it is anticipated releases will total between 10 and 11 million pink and 10 thousand chum fry. Short term rearing (1.6 million fry) and fin clipping experiments were initiated during the spring of 1977. In addition to substantial local fund receipts from voluntary fishermen catch assessments and cannery matching grants, the corporation utilized heavily the new State Private Hatchery Loan Fund for planning and construction, as well as Department of Labor CETA and on-the-job training funds.

II. Introduction

This reporting year was the first with most key designed structures relatively completed and primary operational techniques possible. In that final construction of some components will not be completed until Fall 1977, and broodstock build-up is far from accomplished, operations will not be fully normal until 1978 or later.

An amended permit covering the operating year, including a remote egg take in Galena Bay, Valdez, Arm, was negotiated orally with the Department of Fish and Game in August 1976; the written permit was transmitted October 13, 1976. This permit allowed up to 15 million pinks and 5 million chum eggs to be taken in Galena Bay. As a new stipulation of the permit, fry marking of the 1976 brood class was required.

Port San Juan hatchery was officially dedicated by the Governor of Alaska, the Honorable Jay S. Hammond, on September 30, 1976. A number of inspection tours and technical assistance visits were made by Fish & Game Department personnel during the reporting year, at both San Juan hatchery and the Galena Bay egg-take site. Mr. Al Didier, department pathologist, conducted

an inspection of fry on March 31, 1977.

There have been no basic changes in general philosophy or objectives of the corporation in development of the San Juan facility. The semi-completed construction has achieved water and egg and fry handling facilities as described in the permit application of June 1975, the corporation prospectus of July, 1975 and the annual report of June 1976. Still not completed are permanent facilities to handle returning adults.

Substantial pink salmon brood stock development at the hatchery creek has been provided for by operations on imported donor stocks which resulted in one million fry outmigration in 1976 and about 10 times that number in 1977. Permanent facilities for 37.5 million green eggs and 20 million eyed eggs were completed prior to the 1976 adult run. Failure of the pink and chum salmon wild stocks in 1977 to reach forecasted levels resulted in inability of the corporation to obtain its target of 5 million chum eggs, or to fill this void with pink eggs in excess of the planned 15 million stocking of the hatchery.

While the San Juan water supply will not allow expansion to a larger "single pass through" capacity, considerable preliminary study has gone into concepts whereby capacity could be doubled by basement additions using incubation box effluent a second time. Also, conceptual designing of both spawning channels and stream-side incubation boxes is underway; in these a third phase effluent water reuse plus surplus water of the hatchery stream would be utilized. These system enlargements would raise the San Juan fry production potential to near 50 million.

While short range goals at Port San Juan hatchery are near achievement, long range goals for salmon rehabilitation of the Prince William Sound district are already being eroded on the time schedule originally developed by the Corporation in 1975. The 10-year plan called for construction of 300 million egg hatchery capacity. Delays in development of the State contribution to this capacity are already serious. Cancellation of the Humpy Creek facility covered by 1973 General Fund and 1974 State Bond issue, halving of the funding for Prince William Sound in the 1976 bond issue and general delays in start of construction at Cannery Creek will result in a State contribution of only 40 million fry by 1980.

Construction start up of the second corporation facility in Port Wells will also be delayed at least one year due to financial problems, and a new legislative statute requiring area-wide planning prior to new permit issuances. Other private entities within the Sound, i.e., Nerka Corporation at Perry Island, Charles Warren Company at Montague Island, Alyeska Pipeline Service Company and the Cities of Cordova and Valdez, have

failed to develop an assortment of proposed projects (permanent permit by Nerka Corporation only) during the 1975-77 period, except for one coho spawning channel in the pipeline corridor, Lowe River valley.

In the three years elapsed since passage of the Private Salmon Hatchery Act, there has been no change in the basic rationale that the Prince William Sound fishery requires rehabilitation and stabilization via a series of man-made installations. Heavy investment in fishing vessels, gear and processing facilities have occurred in this period, yet three successive chum salmon failures and two pink salmon failures took place. Port San Juan hatchery demonstrated perfectly on its first operational year the impact of a hatchery system; near record rainfall (approaching 200 inches, September 1 - June 1), caused massive flood damage at Larsen Creek, destroying completely the natural spawn; the adjacent hatchery water system was unaffected and the 10 million hatchery fry presently vigorously feeding in Sawmill Bay, Latouche and Elrington Passages represent the highest densities observed in over 20 years.

### III. Hatchery Modifications

The water supply and distribution system was nearly completed during the fall of 1976, as described in the last annual report. Further anchoring with thrust blocks and cables, insulation of pipeline joints, electrical wiring of the built-in heat tape circuits and extension of the subsurface intake pipe to the deep zone of San Juan lake were the principal jobs completed. The new distance from the penstock dam to the submerged intake (20' depth) is 624 feet, allowing full use of storage water plus siphoning of other lake waters in emergencies. The main pipeline, penstock dam to tankhouse, remains at 2,275-foot length.

A major project completion was the tankhouse itself, where pressure reduction, degasification and aeration and screening occurs in a large redwood headtank. The building is heated by a furnace and one wing contains the diesel electric generation system. An uninsulated wooden pipeline (12" upper, 8" lower section diameter) also enters the tankhouse system; water source is separate from that of the main pipeline, thus allowing summer water availability during maintenance shutdowns or emergencies along the main pipeline. Chambering and screening within the main headtank eliminates air entrapment and detritus in the hatchery water system.



Within the main hatchery building, only 60 of the proposed 70 incubation boxes were plumbed with water pipes when it became evident the egg takes would be less than the desired goals. A total of 51 boxes was used for egg-alevin incubation through the winter. Four other boxes were used for feeding experiments on early emerging Larsen Creek fry. Six large boxes (4' x 8' x 4'), in the basement, which receive effluent from incubations boxes on the second floor, were fitted with recycle pumps; however, abundance of winter water this year meant that this recycle system was used only for periodic chemical treatment of the eggs.

A 12" plastic, insulated pipeline was installed to deliver all hatchery and tankhouse overflow effluent back to Larsen Creek, in the pool at the base of the barrier falls. This line also carried salmon fry released in the hatchery building. Domestic sewerage and water from hatchery floor drains moves through a separate effluent system to a large sewer plant located in the water front warehouse. An earthslide during heavy rains in fall, 1976, damaged the Larsen Creek effluent line; repairs were effected prior to fry release in the spring.

The 1977 construction season will see the majority of remaining projects completed. Projects include: 1) replacement of rubble dam damaged by 1976-77 floods with concrete dam to insure full storage capacity in San Juan Lake; 2) remote sensing indicator to relate lake level to hatchery at all times; 3) miscellaneous additions to further insure integrity of main pipeline; 4) hatchery building addition to provide work space, short-term rearing tanks and storage on the main floor and an apartment for a fish culturist on the second floor; 5) cold storage additions to handle fish food for short-term rearing; 6) installation of a saltwater pumping system to be used as egg-alevin fungicide; 7) enlargement of the saltwater float and holding net system to handle both adults (maturing broodstock and surplus fish storage) and juveniles during short-term feeding.

Finalization of design for delta installations, including egg take facilities, maturing ponds, spawning and flood diversion channels will be completed in 1977. Anadromous Fish Act and perhaps Corps of Engineer permits will be required before construction on these patented tidelands during May - June - July 1978.

Personnel changes during the year consisted of addition of a new fish culturist position to the budget and some expansion of temporary fish technician funding through CETA assistance. A culturist recruited in Fairbanks worked on both homestream and remote egg takes, egg sterilization, stocking and dead egg separation. However, personal problems caused resignation of this employee in mid-fall and the position was not refilled until June 1, 1977. The new culturist has nearly 8 years

hatchery experience with Washington Department of Game. Increases in temporary technicians were associated with enumeration of fry from the 1975 donor stock eyed-egg plants, processing of tray and Astroturf equipment, initiation of a separate egg-take at the hatchery stream as well as short-term fry rearing and fin clipping experiments. The above were additions to the basic operations manpower of 1975: Fishery Biologist (acting hatchery manager), maintenance technician and remote egg-take crew supervised by a fisheries consultant. On the latter program, extensive technical assistance came from William Smoker, Jr., of Netarts Hatchery, Oregon State University, (30 days), and Dave Gaither, regional culturist of F.R.E.D., Anchorage (3 days). The costs related to Mr. Smoker were borne by the Alaska Sea Grant program, which also sponsored a major estuarine study at Port San Juan by the Institute of Marine Science during both Spring 1976 and Spring 1977. Transportation and room and board for Mr. Gaither was paid by this corporation.

#### IV. Operational Procedures

##### (A) Operational Prerequisites

The first annual renewal of Permit No. 2, Port San Juan Hatchery, Larsen, Creek, Alaska provided guidance and constraints as follows: (see also Attachment #1)

1. General rules for egg takes and hatchery operations and other corporate activities as slightly amended from the original permit of 1975.
2. Specific designation of donor stocks available in 1976:
  - (a) Pink stocks: Duck River, Millard Creek, Indian Creek, are located in Galena Bay, Valdez Arm, Prince William Sound, some 90 miles northeast of Port San Juan. Only two of the three streams were eligible for use.
  - (b) Chum Stocks: Duck River, Galena Bay.
3. Limit on donor stock use to 15,000,000 pink and 5,000,000 chum eggs.
4. An attempt to amend upward the pink egg quota in view of the lack of chum salmon at the designated donor stream was denied by the Commissioner.
5. An oral approval was obtained from the Area Management Biologist to artificial spawn all pink salmon entering Larsen Creek, Port San Juan, in excess of a 400-fish spawning escapement.
6. An attempt to amend the permit to allow a coho egg take for a Valdez rearing project was denied by the Commissioner.

7. Notice was contained in the permit that subsequent fry marking from these egg takes might be required.

(B) Egg Takes

1. Remote Egg Take of 1976:

Weakness of wild stocks of the desired stream-types in the western Sound in 1976, required alteration of original permit applications which called for return to the 1975 site. Fish and Game Department management determined that surplus escapements of pink salmon were available only at Galena Bay, some 90 miles northeast of Port San Juan. No surplus of chum salmon were noted in the Sound, thus negating a planned 5 million egg take of that species.

A special committee of Prince William Sound Aquaculture Corporation fishermen board members designed an entirely new adult holding net system for the 1976 egg take. Chairman James Tutt adopted mid-west fish farm methods to our local requirements, standardized plank and styrofoam log floats 10' x 2' x 1' deep were constructed; angle-iron frames capped each end and six special connectors were welded to each frame, allowing three options for bolting floats together. In actual use in Galena in 1976, these floats created 5 separate 20' x 7' holding pens. A 30' x 20' extra storage pen was added midway through the egg take. Ease of shipment and warehouse storage and long-term reuse for fry feeding and adult egg-takes of the float components were achieved by this investment.

The other principal components of the adult holding system were buoyant PVC (2" diameter) frames on which herring bunt mesh was tightly stretched. Panels were 10' x 7' (side and bottom units) or 7' x 6' 8" (end units). Sets of these panels were lashed together on the beach, floated to the pens and easily hoisted into the 20' x 7' openings between floats. Maintenance of full buoyancy in the PVC pipe did not prevent submerging to the 6' working depths; it was helpful in assisting general buoyancy of float system and in lifting to clean and repair. Special small PVC frames 6' 8" x 6' 8", hung with mesh in a slight bag, were extremely helpful in herding fish within the holding pen; 40 to 60 fish were scooped up and held on the surface for easy dipping with these unattached component nets.

The corporation chartered a large vessel (M/V YANKEE CLIPPER) and a Cessna 185 aircraft to carry out the Galena Bay egg-take operation. The vessel was at the site from August 22 to September 21, the period being prolonged by violent windstorms which prevented aircraft flights on several days between September 7 and 20. Some 41 flights with eggs were made by the chartered aircraft between August 25 and September 21; 40 of these flights were completed to the hatchery and carried 14,028,904 pink and 17,112 chum eggs. One aborted flight resulted in 290,000 pink eggs being lost when the aircraft was forced by weather to standby in Cordova.

As per the permit issued by the Commissioner, two lake-fed streams at the head of Galena Bay, Millard Creek and Duck River, were selected as brood sources. Duck River was the source of most of the pink and all chum eggs obtained despite late season commercial seining in this bay, which took several hundred thousand pinks, some 20,000 Millard Creek and 50,000 Duck River pinks remained surplus to escapement needs when fishing for egg-take operations began on August 23. New pinks continued to arrive at Duck River until about September 1, however, the chum run was essentially over, with only a few spawned out fish remaining in the river on August 23.

Shallow depths at the head of Galena Bay, plus the need for frequent access by the aircraft resulted in a decision to position the charter vessel and holding pens in a reef-protected zone, 25 feet deep, midway between the two donor streams. Combined optimum capacity of the five 20' x 7' holding pens (one for males, four for females) was about 6,000 pinks with moderate crowding. Constant restocking with near mature fish became a necessity for two reasons: 1) prolonged immaturity occurred among the earliest females caught in deep water near the pens, and 2) daily spawning activities often utilized 1,000 or more fish. Source fish of proper maturity were in excess of one-half mile distance from the holding facility. A special wire and styrofoam 12' x 12' live-car transported 14,090 salmon to the pens; live boxes in a skiff transported 3,436 salmon from the fishing grounds. Portion of time required for fishing and transporting was the most serious problem encountered in the Galena egg-take of 1976, since the egg taking crew was short-handed during absence of the fishing crew.

Bleeding racks and four egg-take stations were constructed on the stern of the M/V YANKEE CLIPPER. Transporting dead pinks to a shore egg-take station, as in 1975, was thus avoided. Egg-take stations were outfitted with gravity-fed water from Duck River, via a large tank secured in the mast of the vessel.

The culturist and supervisory biologist, plus the consulting biologist from Netarts Hatchery performed most of the actual artificial spawning; some temporary technicians were trained on small lots of eggs. Dipping, maturity testing, bleeding of adults and washing and packaging of eggs were performed by the temporary technicians. Bleeding was accomplished using both head and tail cuts; the latter method required an extra employee to hold the fish during egg extraction, but had the advantage of producing slightly higher egg quality. An added feature in 1976 was extensive use of paper towels to remove blood and slime prior to opening the body cavity.

Plastic and steel (Addis Wonder knife) knives specially designed to cut open the body cavity were used in 1976, resulting in higher egg quality than obtained with other fish knives in 1975. After the belly cut was made, ovary membranes were gently shaken to remove remaining eggs. The operation was again performed over deep plastic dish pans. Eggs from six females were fertilized with sperm from four males (each male used twice) to make each egg batch (about 10,000 eggs). Sperm was gently swirled for good distribution, water was added and the mixture usually set for 2 to 5 minutes before clean water was added to float off excess sperm and impurities. When reasonably clean, eggs were poured into 3-gallon buckets filled with clean cold water from Duck River; to minimize egg mortalities, water in the buckets was not changed while awaiting the airplane. A minimum one-hour period was allowed for water hardening before loading buckets on the airplane.

The above procedures were graded as good by both Dave Gaither, regional culturist for F.R.E.D., and William Smoker, Jr., hatchery consultant from Oregon. Visual assessment upon arrival at the hatchery was made for each bucket; it was estimated obvious mortalities were nearly always 1 percent or less.

Table 1 lists the date, time and location of fishing sets made at Galena Bay in 1976. The number of fish shown are only those transported to the holding pens. The majority of male pinks caught were released alive on the fishing grounds without enumerations. A total of 21,883 pinks and 19 chums were transported to the pens between August 23 and September 21. A 65 fathom long x 4 fathom deep herring beach seine was utilized in all fishing activities; usually less than 20 fathoms of one end of this net produced 1,000 to 2,000 pinks per set at the main source, Duck River. Sets were made at half to high tide inside sloughs where spawning and spawned out fish could be avoided. Small mesh size of the herring seine acted to avoid injury to the fish through gilling and minimized the hang-ups of male teeth, which is the principal problem in fishing on pinks of advanced maturity.

Table 2 lists the separate air shipments of eggs, from Galena Bay to Port San Juan. Date, time of flight departure, estimated number of eggs as determined by volumetric measurements at the receiving end, method of egg preparation and number of male and females utilized each day are shown in this table. While the standard shipping unit was water-hardened eggs in 3-gallon buckets (18 females, 6 males or 30,000 eggs average/bucket), a dry-on-ice experimental series was also utilized in 1976. The ice shipments totalled 2,287,869 eggs of the 14.3 million total egg takes. Sperm from Larsen Creek males was used to fertilize iced shipments prior to September 1, and sperm shipped from Galena Bay for shipments thereafter.

TABLE 1

Summary of Fish Caught and Held in Maturing Pens at  
Galena Bay, 1976

Date	Time	Location	Pink Salmon		Chum Salmon		Mortalities in Transit*
			Female	Male	Female	Male	
8/23	1000	Millard Cr.	192	83	0	0	
8/23	1500	" "	340	172	0	0	
8/23	1800	" "	25	0	0	0	
8/24	1145	Duck River	132	125	2	3	
8/24	1900	Millard Cr.	222	140	0	0	40 Pinks
8/25	0800	" "	593	450	0	0	
8/25	1300	Duck River	364	61	3	0	
8/26	0900	Millard Cr.	111	26	0	0	
8/26	1000	" "	559	176	0	0	
8/26	1330	Duck River	297	3	1	3	
8/27	0900	Millard Cr.	971	327	0	0	
8/27	1330	Duck River	345	20	3	0	
8/28	1600	Duck River	320	197	0	0	
8/29	1400	" "	793	504	2	0	
8/29	1700	" "	200	1	0	0	
8/30	1400	" "	643	201	0	0	
8/31	0900	" "	125	0	0	0	
8/31	1930	" "	375	100	0	0	
9/1	0700	Duck River	500	100	0	0	
9/1	1900	" "	500	100	0	0	
9/2	0800	" "	800	20	0	0	
9/4	0900	Millard Cr.	635	130	0	0	
9/4	1400	" "	300	20	0	0	
9/4	1830	" "	400	25	0	0	
9/5	1330	Duck River	288	7	0	0	
9/6	1245	Millard Cr.	540	120	0	0	
9/6	1630	Duck River	300	20	0	0	2 chums
9/7	1030	Millard Cr.	1100	40	0	0	
9/7	1400	" "	180	20	0	0	3 chums
9/8	1045	" "	200	0	0	0	
9/8	1300	" "	850	50	0	0	
9/8	1800	" "	55	30	0	0	2 chums
9/9	1115	Duck River	650	250	0	0	
9/9	1500	" "	180	60	0	0	
9/10	1110	Millard Cr.	200	100	0	0	
9/10	1430	Duck River	600	600	0	0	0 (pinks, 100 fem.
9/11	1530	" "	450**	0	0	0	0 ( 200 male
9/12	1400	" "	745	0	1	1	
9/12	1630	" "	250	20	0	0	
9/13	1530	" "	810	50	0	0	

continued

TABLE 1 (continued)

Summary of Fish Caught and Held in Maturing Pens at  
Galena Bay, 1976

Date	Time	Location	Pink Salmon		Chum Salmon		Mortalities in Transit
			Female	Male	Female	Male	
9/17	1700	Duck River	70	0	0	0	2 chums
9/18	0500	" "	30	0	0	0	
9/19	0500	" "	50	0	0	0	
9/20	1500	" "	210	0	0	0	
9/21	0700	" "	35	0	0	0	(Cumulative Es (500 females, 1 (male pinks in
Total Caught and Held			17,535	4,348	12	7	940 pinks 9 chums

\* 8/24 mortalities from net bag when skiff over-turned; 9/10 mortalities presumedly due to over-crowding or too long in transit; all other mortalities listed reflect fish found dead in bottom of holding pens, cause of death unknown.

\*\* Additional 150 spawned-out females were caught and transported, but later sorted out and returned to open waters of Galena Bay.

TABLE 2

Summary of Salmon Egg Shipments from Galena Bay to  
Port San Juan, 1976

Shipment Number	Date	Departure Time	No. of Eggs	Type of Preparation*	No. of Fish Spawmed*	Female	Male
1	8/25	1230	134,044	WH			
2	8/25	1900	50,160	WH		111	36
3	8/27	1300	109,061	WH			
4	8/27	1900	77,208	WH		133	49
5	8/28	1300	94,911	WH		66	26
6A	8/29	1330	114,582	WH			
6B	8/29	1330	56,744	D-I			
7A	8/29	1915	168,811	WH			
7B	8/29	1915	26,418	D-I		229	87
8A	8/30	1300	490,590	WH			
8B	8/30	1300	66,516	D-I			
9	8/30	1930	250,240	WH		529	159
10A	8/31	1230	144,095	WH			
10B	8/31	1230	172,920	D-I			
11	8/31	1830	232,300	WH		316	73
12	9/1	1015	233,458	WH			
13	9/1	1400	459,232	WH			
14	9/1	1940	257,996	WH		626	202
15	9/2	1100	172,398	WH			
16	9/2	1400	214,878	WH			
17	9/2	1910	660,464	WH		686	211
18A	9/3	1545	109,872	WH			
18B	9/3	1545	180,792	D-I			
19	9/3	1815	152,835	WH		208	66
20A	9/4	1005	81,585	WH (9/3)			
20B	9/4	1005	139,527	WH			
21A	9/4	1340	244,944	WH			
21B	9/4	1340	14,450	WH		5	1 CH
22	9/4	1900	335,731	WH		449	181
23A	9/5	1210	63,506	WH (9/4)			
23B	9/5	1210	290,071	WH			
23C	9/5	1210	283,716	D-I			
24A	9/5	1915	274,512	WH			
24B	9/5	1915	50,844	WH		606	210
25	9/6	1240	296,074	WH			
26A	9/6	1830	72,352	WH			
26B	9/6	1830	480,816	WH		483	171
27A	9/9	1100	300,672	D-I (9/7)		184	60 (9/
27B	9/9	1100	337,810	WH			
28	9/9	1515	500,816	WH			
29A	9/9	1915	395,579	WH			
29B	9/9	1915	152,712	D-I		863	287
30	9/10	1315	661,760	WH			
31A	9/10	1830	306,288	WH			
31B	9/10	1830	89,856	D-I		653	211

continued



TABLE 2 continued

Summary of Salmon Egg Shipments from Galena Bay to  
Port San Juan, 1976

Shipment Number	Date	Departure Time	No. of Eggs	Type of Preparation*	No. of Fish Spawners Female	Male
32A	9/11	1500	154,035	WH		
32B	9/11	1500	113,190	D-I		
33A	9/11	1830	317,301	WH		
33B	9/11	1830	90,820	D-I	444	194
34	9/12	1100	290,000***	WH	183	62
35A	9/15	1700	244,530	D-I (9/13)	149	60 (9,
35B	9/15	1700	2,662	WH (9/13)	1	2 cl
36A	9/16	1155	555,960	WH		
36B	9/16	1155	236,565	D-I		
37	9/16	1530	479,490	WH		
38A	9/16	1815	257,073	WH		
38A	9/16	1815	133,770	D-I	922	313
39	9/19	1345	452,230	WH		
40	9/19	1600	525,250	WH	606	201
41A	9/21	1300	138,648	D-I (9/20)		
41B	9/21	1300	6,440	WH (9/20)	207****	54
41C	9/21	1300	305,952	WH	182	54

Seasons Totals:	14,301,792 Pinks	8,835	2,967
	17,112 Chums	6	3

\* WH Water-hardened eggs, shipped in 3-gallon buckets filled with water. Approximately 30,000 eggs per bucket.

D-I Dry eggs in plastic bags, shipped surrounded by ice in insulated containers. Bags contained 20,000 eggs each.

\*\* Daily totals of fish spawned to make up all shipments during day. Includes immature or other poor quality females which produced no eggs for the shipments.

\*\*\* This shipment lost due inability of plane to land at hatchery during bad windstorm; eggs were mostly dead when storm allowed plane to depart Cordova 24 hours later. All other shipments were received and processed inside of the hatchery.

\*\*\*\* Most of these females processed on 9/20 were spawned out or partially spawned out, accounting for low egg total.

The discrepancy between Table 1 and Table 2 in regard to numbers transported to the holding pens and numbers spawned was caused principally by the following factors:

1. Estimates of numbers caught and transported were approximations by the fishing crew and evidently were consistently high.
2. On two occasions, pens holding large numbers of fish developed net tears, causing loss of many fish; this was particularly true of the large 20' x 30' net, where escapement losses totalled about 75 percent.
3. Mortalities in the pens were minimal, but enumeration of discarded dead was not accurate.
4. The numbers of fish actually spawned were carefully enumerated and therefore, best describe the 1976 egg take operational totals.

The fecundity of the Galena Bay female pinks averaged 1,709 eggs for selected lots of fish without individuals which were immature or partially spawned. The net average (Table 2), for eggs produced from all females processed was 1,619; thus about 5 percent of the potential egg take was lost due to egg retention in fish not fully mature and some spawned out or partially spawned fish in the catches. The six chum females averaged 2,852 eggs.

In summary, the Galena egg take was one of the largest ever attempted in Alaska. Innovations to improve the operation were numerous. Ninety five percent of the 15 million pink egg goal was obtained and removal of fish excess to desired stream escapements probably improved quality of the latter. Serious failure of the forecasted good chum run prohibited achievement of the 5 million egg goal. The combined cost of labor, supplies, vessel and aircraft exceeded \$60,000, or well beyond the capabilities of most private operators.

## 2. Larsen Creek Egg Take

As a part of the operational function of the Port San Juan Hatchery, pink salmon were caught and artificially spawned from Larsen Creek, adjacent to the Port San Juan Hatchery. The total 1976 salmon escapement to Larsen Creek was estimated at slightly more than 1,000 pinks.

On August 13 and 14, 1976, a fish weir was built and placed in Larsen Creek. The weir was a simple construction of rebar and chicken wire and was located a little downstream from the mean high tide level. This weir was not designed to catch all of the pinks returning to Larsen Creek. At high tide, the salmon could swim around the weir, upstream, and spawn naturally. A few also spawned naturally in the intertidal area below the weir. Once a day the weir and nearby creek area were checked for ripe or mature pinks. The salmon at the weir and creek were removed by means of a dip net. Immature fish were returned to the creek, and mature fish were artificially spawned. No pre-spawning mortalities were observed from this fishing operation. The sum of catches, as shown in Table 1, was 278 males and 454 females, for a total of 732 pink salmon. The 454 females produced 704,626 eggs for an average fecundity of 1,552.

Both male and female pinks were killed by means of a blow to the head with a blunt object. The fish were held by the tail in one hand, while being struck on the head with the other. After being killed, the fish were taken to a temporary egg take station which was erected near the fish weir, out of 2 x 4's and visqueen. Here they were placed on a bleeding rack. A knife slice was made on only the females, just above the caudal fin, and they were allowed to bleed for several minutes. Eggs were taken by the 2-man method. One person held the female over the egg receptacles while a second person slit their abdomens and removed the eggs. A minimum ratio of 3:1, females to males were used. However, due to a surplus of mature males, the ratio of females to males at times was as high as 1:1. After milt and water were added, the eggs were gently swirled and allowed to sit for a minute to insure fertilization. The eggs were then washed with fresh water from Larsen Creek to remove any foreign materials such as slime, blood, excess milt, etc. Next, they were placed in a large bucket, covered with black plastic to exclude light, and allowed to water harden for several hours. Once water hardened, they were carried up to the hatchery building, approximately 100 yards away, where they were enumerated and processed.

TABLE 3

Summary of Pink Salmon Caught and Spawned at Larsen Creek, 1976

Date	No. of Males Spawned	No. of Females Spawned	No. of Eggs Taken	Ave. Fecundity Female
8/18	3	6	7,744	1,291
8/19	5	4	5,980	1,495
8/22	65	69	102,870	1,491
8/23	24	30	47,432	1,581
8/24	52	85	160,160	1,884
8/25	10	13	22,244	1,711
8/26	15	29	45,872	1,582
8/27	15	19	29,542	1,555
8/28	12	24	30,134	1,256
8/29	14	18	27,608	1,534
8/30	18	49	66,421	1,356
8/31	17	40	58,919	1,473
9/1	11	32	44,774	1,399
9/2	9	24	39,680	1,653
9/4	6	6	6,655	1,109
9/8	2	6	8,591	1,432
TOTAL	278	454	704,626	$\bar{M} = 1,552$

## C. Incubation and Rearing

### 1. Receipt and Processing of Green Eggs:

In addition to the 704,626 eggs received from Larsen Creek, (Table 1), the Port San Juan Hatchery received 14,028,904 green eggs from Galena Bay (See Table 2 in previous section).

The buckets and ice chests of eggs were carried by hand from the airplane float on the face of the dock, to the hatchery building. The unfertilized eggs were immediately fertilized and stored in large shaded buckets to water harden. Because of a surplus of males in Larsen Creek, a small study group of about 150,000 hybrids (eggs from Galena Bay and sperm from Larsen Creek) were processed.

Accurate records were kept of the number of buckets and ice chests arriving, date and time of fertilization, brood fish origin, date and time eggs were processed, number of eggs per bucket, etc., for future analysis. One-ounce samples were run on each bucket of eggs to determine the number of water-hardened eggs per ounce.

The fertilized eggs were measured by volume into the incubation trays. These trays are 20" x 14" x 4" deep with a perforated bottom. Approximately 10,000 eggs were placed into each tray. The trays of eggs were then disinfected by immersing them in a dilute Wescodyne solution (1:150) for 10 minutes. The eggs were removed from the Wescodyne solution, rinsed off, and placed into the incubation boxes. Fifty-four trays were loaded into each box, resulting in a total of 540,000 eggs per box. Care was taken to avoid any excessive handling.

This phase of the hatchery operations (egg-take and processing of green eggs), encompassed 35 days, from the first eggs taken in Larsen Creek, August 18, 1976, to the last green eggs processed from Galena Bay on September 21, 1976. A cumulative total of 14,733,530 eggs (Larsen Creek and Galena Bay) were loaded into 28 incubation boxes.

### 2. Development of Eggs:

From the first day the eggs were loaded into the incubation boxes, August 18, 1976, daily water temperatures (figure 1) and thermal units (figure 2) were recorded. Periodic dissolved oxygen tests were also run on the hatchery intake water and the hatchery discharge water (Table 3). The eggs were checked regularly for any signs of fungus, disease or other problems.

The first treatment of malachite green was administered on September 3, 1976, nine days after the first eggs were placed in the incubators. The flush method was used with a solution of 1:200,000. The eggs were treated once every four days until

FIGURE 1. Pipeline Intake Water Temperatures,  
Port San Juan, 1976 - 1977.

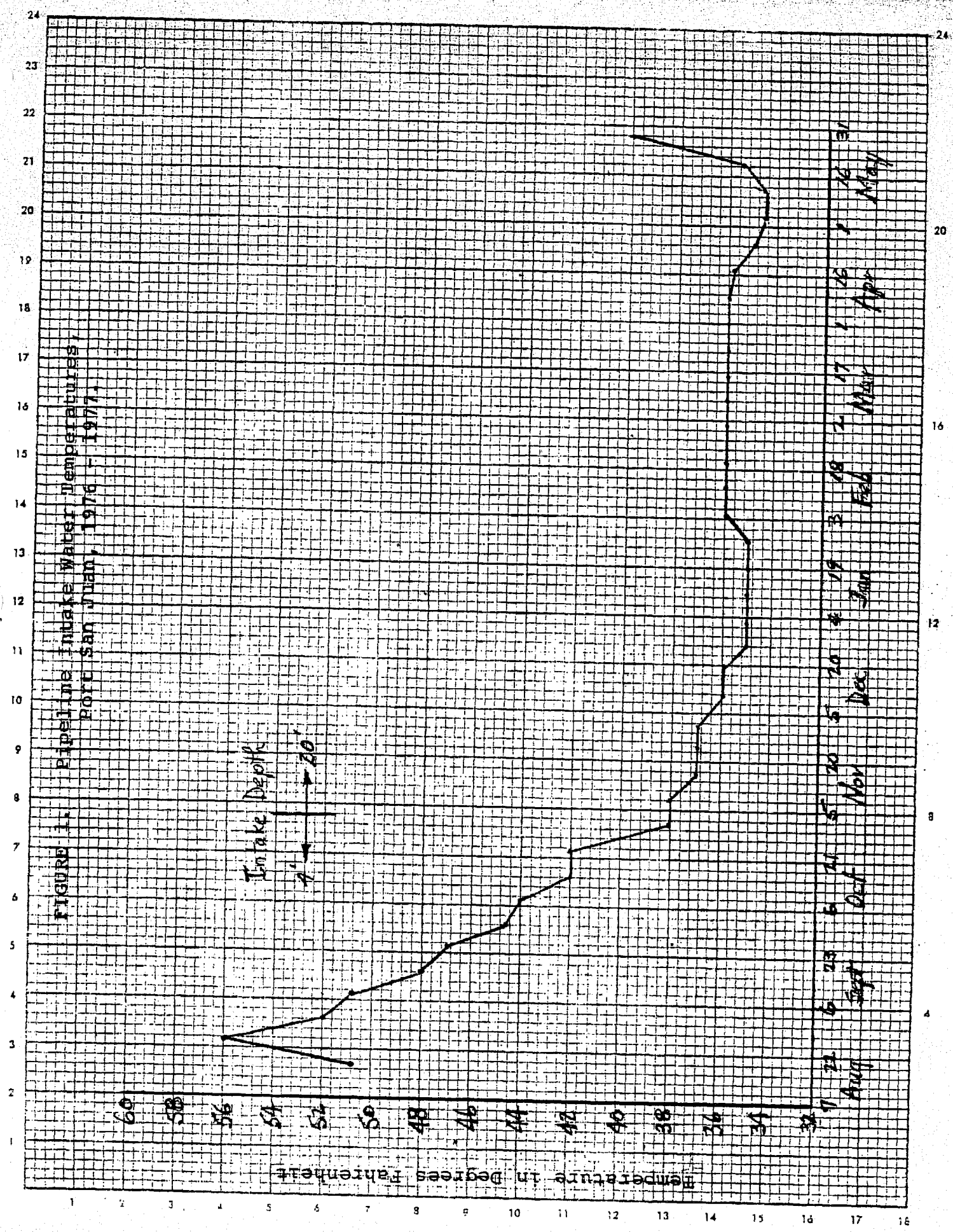




FIGURE 2. Development of Eggs and Alevins in Cumulative Temperature Units.

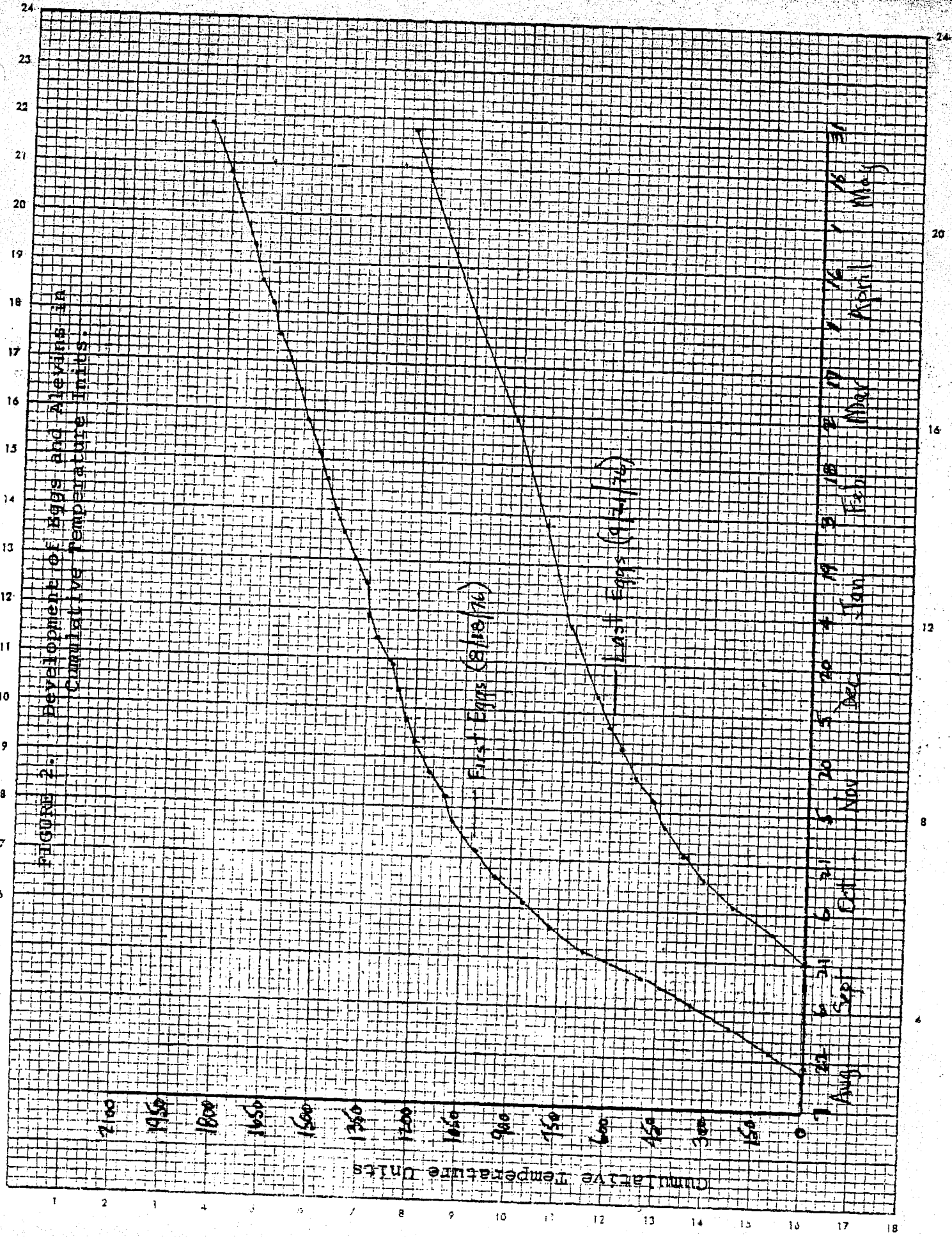


TABLE 3

Dissolved Oxygen Tests  
Port San Juan Hatchery, 1976-77

H <sub>2</sub> O			
Date	Temperature	D.O. Intake	D.O. Outlet
9/6/76	50.5° F.	8-9 mg/l	8 mg/l
9/14/76	48° F.	8 mg/l	8 mg/l
9/23/76	47° F.	8-9 mg/l	8-9 mg/l
9/28/76	46° F.	9-10 mg/l	8-9 mg/l
10/5/76	44° F.	8-9 mg/l	8-9 mg/l
10/12/76	42° F.	8 mg/l	8 mg/l
10/30/76	38° F.	8 mg/l	8 mg/l
11/17/76	37° F.	8-9 mg/l	7-8 mg/l
11/25/76	37° F.	8-9 mg/l	8-9 mg/l
12/3/76	36° F.	9-10 mg/l	8-9 mg/l
12/11/76	36° F.	8 mg/l	8 mg/l
12/23/76	35° F.	8-9 mg/l	8-9 mg/l
12/31/76	35° F.	9 mg/l	8-9 mg/l
1/20/77	35° F.	9 mg/l	8-9 mg/l
2/2/77	35.5° F.	9-10 mg/l	8-9 mg/l
2/9/77	36° F.	9-10 mg/l	8-9 mg/l
2/17/77	36° F.	9-10 mg/l	8-9 mg/l
2/26/77	35.5° F.	9 mg/l	9 mg/l
3/9/77	36° F.	9 mg/l	8 mg/l
3/17/77	36° F.	8-9 mg/l	7-8 mg/l
3/25/77	36° F.	8-9 mg/l	7 mg/l
4/4/77	36° F.	8-9 mg/l	7 mg/l
4/13/77	36° F.	8-9 mg/l	6-7 mg/l
4/23/77	35° F.	8-9 mg/l	7 mg/l
5/1/77	34.5° F.	8-9 mg/l	7-8 mg/l
5/9/77	34.5° F.	9-10 mg/l	8-9 mg/l
5/16/77	35.5° F.	9 mg/l	8-9 mg/l
5/23/77	38° F.	9-10 mg/l	8-9 mg/l



hatching began. Although some Saprolegnia parasitica was present on the dead eggs, it never spread or became a problem to viable eggs. No chemical treatments were given after the eggs hatched, and no disease problems were observed.

During the first couple weeks of incubation, while the main water line and water distribution system were being finalized, a few problems with air bubbles in the incubators were encountered. However, they were quickly remedied and were never a major problem. An adequate number of filters in the water distribution system eliminated any debris problems.

### 3. Processing of Eyed Eggs and Transfer to Astroturf:

On September 24, 1976, the first eyed-out eggs were processed and transferred to Astroturf. The trays of eggs were removed from the incubation boxes and placed in work troughs. Eggs were "shocked" by siphoning them through a 4 1/2' length of common garden hose from the troughs to a bucket on the floor. The eggs were then placed back into the trays and returned to the incubation boxes.

After a period of 48-72 hours, the eggs were once again removed from the incubation boxes and run through a machine called Buzzell's Egg Picker. It took five passes of the eggs through this machine to achieve a 96 percent separation of the dead eggs and live eggs. The remaining 4 percent of mixed live and dead eggs were then separated by hand picking. Careful records were kept during this operation to establish the number and percentage of dead eggs for each bucket of eggs taken.

On November 15, 1976, Dave Gaither of the F.R.E.D. Division of Alaska Department of Fish and Game, came to Port San Juan and brought with him a Jensorter, egg sorting machine. This machine was easier on the handling of the eggs than the Buzzell Machine, and we were able to achieve a 99.5 percent separation of live and dead eggs. Unfortunately for us, Mr. Gaither and the Jensorter machine were only able to stay at Port San Juan for one day. However, after comparing the two machines side by side, it was obvious that the Jensorter machine was superior to the Buzzell machine. Rental costs on the Jensorter far exceed that of the other machine.

After all the dead eggs had been removed, the viable eggs were measured by volume and loaded onto layers of Astroturf. Each layer of substrate was loaded with between 6,700 and 7,200 eggs. This resulted in a rather conservative density of 7 to 7 1/2 eggs per cubic inch of substrate. This compares with a loading density of approximately 9.6 eggs per square inch of substrate used in most of the F.R.E.D. Division hatcheries. Thirty-two layers of horizontal Astroturf were used per box. Thus a total of 214,000 - 230,000 eggs were placed in each incubation box. In order to fully load the hatchery with 20 million eyed pink eggs, a density of 9.6 per cubic inch would be necessary.

The "developmental difference", as recorded in temperature units, between the first eggs taken on 8/18/76, and the last eggs taken on 9/21/76 was about 2 1/2 months. Thus, the eggs taken on 8/18/76 were eyed-out and ready for processing on 9/24/76, whereas the eggs taken on 9/21/76 were not eyed-out and ready for processing until 11/20/76. The processing was slightly behind the development of the eggs and was not completed until 11/29/76. In all, it took 67 days to complete the processing and transfer of the 14,733,530 eggs to Astroturf.

The cumulative totals at the end of this processing phase were as follows:

<u>Total Live</u>	<u>Total Dead</u>	<u>Percent Survival Green Eggs to Eyed Eggs</u>
11,351,110	3,382,420	77 percent

The 11.8 million water hardened, fertilized eggs sent from Galena Bay had an overall mortality of approximately 20 percent. The 2.2 million unfertilized eggs sent in ice chests had an overall mortality of approximately 39 percent. The .7 million eggs taken from Larsen Creek had an overall mortality of 15 percent. Two causes of the high percent mortality in the ice chest eggs seems to have been: (1) eggs being broken in shipment and (2) sperm that was to some degree contaminated. A large percentage of the dead total was a result to infertile eggs. The relatively high percent of infertility was not discovered until the "shocking" phase had been completed. A total of 51 boxes were used to incubate the 11,351,110 eyed out eggs.

#### 4. Overwinter Development

Hatching of the eyed-out eggs began on October 28, 1976. Approximately 50 percent of the eggs were hatched by 12/13/76 and by 1/31/77, 100 percent hatching had been completed. An examination made of all the incubation boxes after hatching indicated that survival from the eyed out stage to the alevin stage was good (96 - 98 percent).

The incubation boxes were fitted with a false bottom of aluminum perforated plate, with 1/8" or 3/32" holes. After the first incubation box had completely hatched, the box was checked to see how many alevins had passed through the perforated plate. It was noted that all of the alevins had migrated to the bottom of the box and that approximately 10 percent or 20,000 alevins had passed through the plate. Upon this discovery, all of the incubation boxes with 1/8" holes in the plates not then in the process of hatching, had a fine mesh screen placed on top of the perforated plate to eliminate this problem. However, this still left 5 boxes without the fine mesh screen. These boxes were checked routinely for the development of the alevins via a drain plug in the bottom of the box. The alevins that

had been trapped beneath the perforated plate, where the water flow was at it's maximum (10 - 15 GPM) and there was no substrate, developed much more rapidly than those in the Astroturf substrate.

Once the alevins were 95-100 percent "buttoned-up", they were drained from beneath the plate via a siphon hose placed in the drain hole. The first such draining of fry occurred on 2/17/77. Since not all of the alevins were 100 percent buttoned up, screens were inserted in all of the Astroturf lined collection troughs underneath the incubation boxes. This prevented any premature out-migration.

Periodic samples of 50 alevins were taken from the troughs. These were measured, weighed, and examined for yolk sac absorption, as well as Kd index. Their development was followed in this manner until they were 100 percent buttoned-up and released.

#### 5. Enumeration and Migration Timing of Resultant Fry

Three separate indices were set up to enumerate the outmigrating fry and as a means of cross-checking final totals.

Index #1 represents a daily count of all the incubators, corrected for the following errors:

- (1) Standpipes - (3.8%) - is the percentage of standpipes not screened to prohibit out-migration because of problems with their locations.
- (2) Night Releases - (11.0%) - the screens in the troughs were pulled out every evening at 8:00 PM and not put in again until 8:00 AM the following morning. Many days of evening counts (8:00 PM - 8:00 AM) revealed that approximately 11 percent more fry were migrating out during this time period, than during the daylight hours of daily counting (8:00 AM-8:00 PM).
- (3) Screen Leakage - (5.0%) - we were unsuccessful in building our temporary, removable screens to achieve a seal that prevented all fry from out-migrating. Periodic samples were run on "leaking" screens to determine what percentage of the daily totals were escaping and not being counted.

The accumulative correction percentage of the above three error factors is equal to 19.8 percent. Thus, the actual daily count was corrected by 19.8 percent. This index is most likely the least reliable, as far as the total numbers released. However, it does show the peak of out-migration and the timing of the release.

Index #2 represents the accumulated totals from five closely monitored troughs or fifteen incubators. Each box was loaded with approximately 220,000 eyed-out eggs. Therefore, each trough (3 boxes) represents 660,000 eggs. Care was taken on these boxes to insure that all of the standpipes were screened. However, corrections still had to be made for (1) night release - 11 percent, and (2) screen leakage - 5.0 percent. Thus the actual counts in Index #2 were corrected by an error factor of 16 percent.

Index #3 is an evaluation based on subtracting the accumulated dead total, compiled when the boxes and Astroturf are cleaned, from the total number of viable eyed-out eggs loaded in the Astroturf.

As of May 28, 1977, Indexes #1 and #2 were approximately 95 percent completed and Index #3 had just begun.

Therefore, the total out-migration figures given here are based on 95 percent of the total data and may change slightly when all the data has been evaluated sometime towards the end of June. The following totals were arrived at by averaging Index #1 (78.2%) and Index #2 (88.5%).

Estimated Total Number of  
Fry Released as of 5/28/77  
(95% complete)

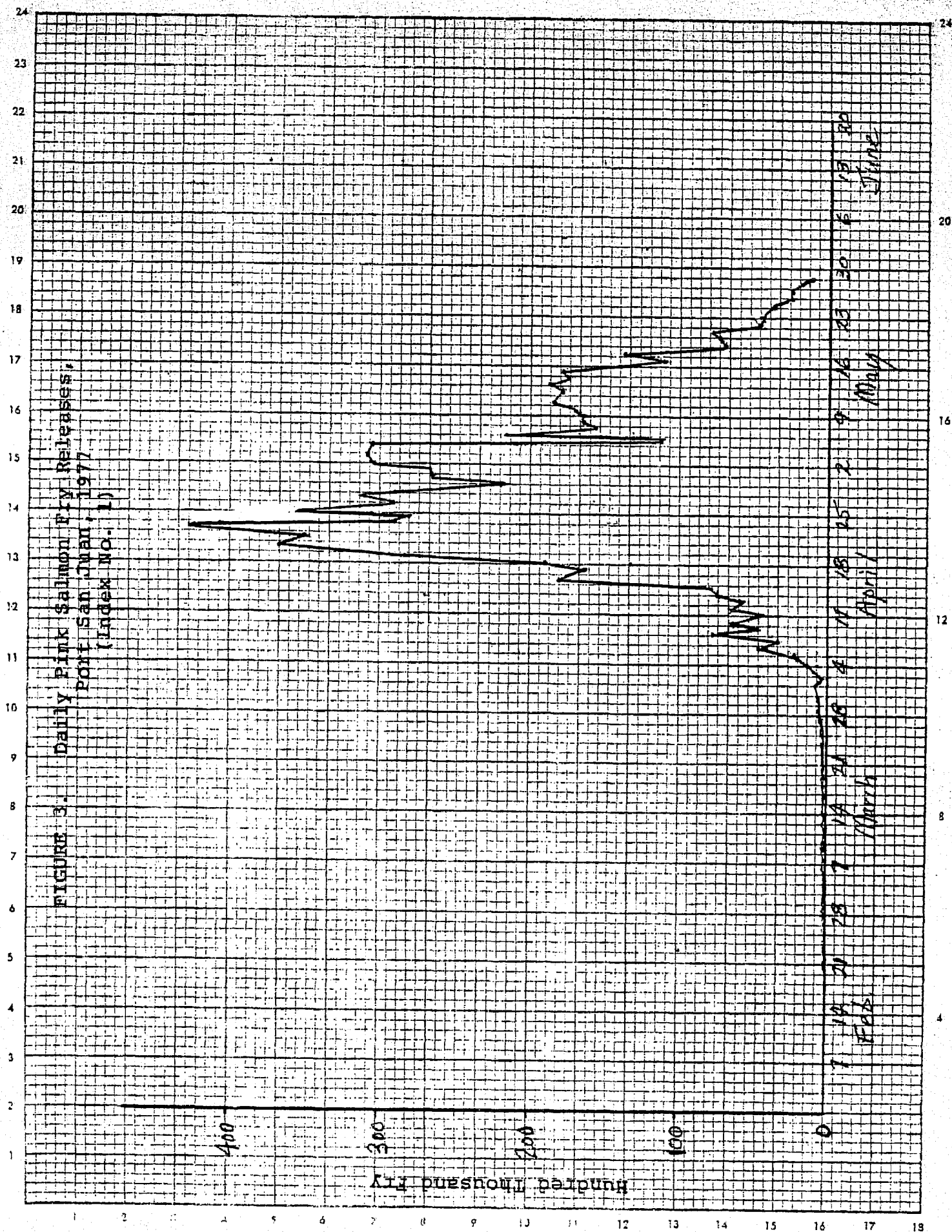
Percent Survival Eyed-  
Egg to Fry  
(95% complete)

9,466,826

83.4%

Special Editors Note: Figures transmitted by the hatchery manager while this report was in final typing indicate the observable egg and alevin mortalities within the Astroturf were running only 2 percent of original eyed eggs placed in the boxes (8 boxes processed). During the winter, an additional one percent dead was accounted for by tapping drain plugs in the boxes and by collections within the catcher boxes. Therefore, Index #3 indicates out-migration of fry totaled (11,351,110 x 97 percent) 11,010,577 fry. Also, counted out-migrations used in indices #1 and #2 were substantial between May 28 and June 10. When all figures are analyzed, the best estimate of total out-migration will be in the range 10 to 11 million, and the eyed egg to fry mortality near the 5 percent level.

The timing of the released fry is shown in Figure 3. The first fry were released on February 18, 1977. During the six week period from 2/18/77 to 3/31/77, a total of only 116,195 fry were released. In the first week of April, the out-migration began to steadily increase with the peak being reached during the third week in April. The majority of the fry release occurred between April 18 and May 18. This is just about one month earlier than the preceeding year. All fry were released into the headwaters of Sawmill Bay, adjacent to the Port San Juan Hatchery.



## 6. Fresh Water Feeding Program

Towards the end of March, a significant number of yolk sac fry began to emerge from the Astroturf. In order to hold these unbuttoned-up early fry, they were transferred into empty incubators and loaded at a density of 30,000/box, or 3/4 lbs of fry/cubic foot.

Each group was fed Oregon Moist Starter Mash eleven times daily for a period of two weeks and then released. During this time no group showed an active feeding response or a substantial gain in length or weight. The water temperature during this program was 34.5° F.-36° F. However, these swim up fry did completely button up prior to release and very low numbers of mortalities were incurred (1-3%).

This fresh water feeding project was carried on from March 23, 1977, until May 6, 1977. By the second week in April, all the fry emerging were completely buttoned up. In all, 263,499 fry were fed for two weeks and then released.

## 7. Saltwater Feeding Program

On May 3, 1977, the first of four 10' x 10' x 7' feeding pens was secured off the face of the dock at Port San Juan in saltwater. Between May 3, 1977 and May 14, 1977, four pens were constructed and loaded with pink fry.

The four pens were loaded at the following densities:

Pen #1	-	251,386
Pen #2	-	401,046
Pen #3	-	350,522
Pen #4	-	301,378
Total		<u>1,304,332</u>

The fry were fed 3.5 percent of their body weight eleven times daily. They were fed for 2 weeks on Oregon Moist Starter Mash and 2 weeks on Oregon Moist Pellets.

Weekly samples of 150 fry were measured and weighed for comparison. The following is a summary of these samples for each pen.

Pen #1	Date	Ave. Length	Ave. Weight
	5/4	31.5 mm	.117 g
	5/10	33.2 mm	.119 g
	5/17	33.4 mm	.214 g
	5/24	34.0 mm	.218 g
Pen #2	5/8	32.6 mm	.220 g
	5/16	33.2 mm	.248 g
	5/22	33.8 mm	.235 g

<u>Pen #3</u>	<u>Date</u>	<u>Ave. Length</u>	<u>Ave. Weight</u>
	5/13	32.0 mm	.209 g
	5/20	33.3 mm	.213 g
	5/27	33.85 mm	.230 g
 Pen #4	5/16	32.3 mm	.203 g
	5/23	32.7 mm	.212 g

It was observed that the fry began actively feeding after 4-5 days in the saltwater pens. The saltwater temperature from May 3, 1977 to May 28, 1977, steadily rose from 40° F. to 44° F. When each pen has been fed for a total of 4 weeks, it will be released into the headwaters of Sawmill Bay. This program is scheduled to terminate on June 11, 1977.



TABLE 4

Number of Fry Released Daily, 1977  
(Index No. 1)

DATE	ACTUAL COUNT	CORRECTED* 19.8%	DATE	ACTUAL COUNT	CORRECTED* 19.8%
2/18-3/31	96,991	116,195	4/30/77	219,731	263,238
4/1/77	5,705	6,835	5/1/77	222,203	266,199
4/2/77	4,069	4,875	5/2/77	255,060	305,562
4/3/77	7,801	9,346	5/3/77	256,769	307,609
4/4/77	11,684	13,997	5/4/77	255,916	306,587
4/5/77	18,185	21,786	5/5/77	94,994	113,803
4/6/77	34,901	41,811	5/6/77	180,391	216,108
4/7/77	28,124	33,693	5/7/77	118,609	142,094
4/8/77	61,879	74,131	5/8/77	135,009	161,741
4/9	34,458	41,281	5/9/77	135,000	161,730
4/10/77	54,403	65,175	5/10/77	140,569	168,402
4/11/77	38,976	46,693	5/11/77	147,989	177,291
4/12/77	54,317	65,072	5/12/77	145,284	174,050
4/13/77	50,348	60,317	5/13/77	155,504	186,294
4/14/77	59,357	71,110	5/14/77	144,870	173,554
4/15	61,821	74,062	5/15/77	147,543	176,756
4/16/77	152,605	182,821	5/16/77	116,679	139,781
4/17/77	135,147	161,906	5/17/77	91,926	110,127
4/18/77	159,198	190,719	5/18/77	113,881	136,429
4/19/77	235,916	282,627	5/19/77	59,694	71,513
4/20/77	306,852	367,609	5/20/77	61,705	73,923
4/21/77	293,638	351,778	5/21/77	65,088	77,975
4/22/77	356,005	426,494	5/22/77	37,953	45,468
4/23/77	241,956	289,863	5/23/77	36,575	43,817
4/24/77	238,494	285,716	5/24/77	29,048	34,799
4/25/77	296,370	355,052	5/25/77	22,669	27,157
4/26/77	243,167	291,314	5/26/77	22,241	26,645
4/27/77	258,427	309,596	5/27/77	15,918	19,070
4/28/77	242,250	290,216	5/28/77	10,659	12,769
4/29/77	184,159	220,622			
				7,406,690	8,873,203**

\* Correction Factors Used:  
 Standpipes outside traps - 3.8%  
 Night-time Higher Rates - 11.0%  
 Screen Leakage - 5.0%  
19.8%

\*\* Represents 78.2 percent of original eyed egg loading total.



TABLE 5

Fry Out-Migrations from Five Randomly Selected  
Index Complexes (15 total incubation boxes)  
Index No. 2, (Figures through May 28, 1977 only)

3-Box Complex Nos.		Actual Count	Correction Factor *	Final Total	Percent of Total Loaded Eggs
22 - 24	=	549,059	x 16%	636,908	96.5%
10 - 12	=	533,972	x 16%	619,408	93.8%
34 - 36	=	547,484	x 16%	635,081	96.2%
49 - 51	=	425,387	x 16%	493,449	74.8%
40 - 42	=	460,667	x 16%	534,374	81.0%
				2,919,220	88.5%

\* Correction Factors:

Higher Night Migration	-	11.0%
Screen Leakage	-	5.9%
Total		16.0%

## 8. Fin Clipping Experiments of 1977

Preparatory to major experiments in 1978, in which a number of key assumptions will be tested, two small experiments were carried on during April and May, 1977 to test equipment, acquaint staff with problems, etc. After extensive negotiation with the Juneau Alaska Department of Fish and Game office, Consultant Wallace Noerenberg and two temporary technicians marked 10,003 unfed pink migrants with Ad-LV marks in the periods April 28 - May 2 and May 9 - 16. These releases (marked during day, released at night) were during the peak period of hatchery out-migration, when over 8 million of the total 10 million plus production were released as unfed fry.

Fry migrating during the same peak period were placed in saltwater rearing pens during early May for 30-day feeding experiments. In the period May 26 - 29, 10,087 pink and 7 chum fry were marked with Ad-RV marks. Only fry which were actively feeding and growing were marked; pinheads which had never fed were avoided. The marked fish all came from Experimental Pen #1, and marked and unmarked were released enmass near the entrance of Sawmill Bay on June 3, 1977.

## D. Return Strength and Uses

The first return from hatchery releases at Larsen Creek will be in August, 1977, and therefore requested details are not available at this time. Planning calls for use of the entire 1977 return for broodstock purposes; the earliest sale of surplus fish or eggs will be in 1978.

There was no Alaska Department of Fish & Game records on the natural wild stock at Larsen Creek prior to corporation activity in 1975. Actually, the 1964 earthquake uplifted the delta about 8 feet, creating the first spawning grounds of about 20' x 150' dimensions. It can be assumed therefore that natural broodstock has only a 10-year history and came from straying of adjacent stocks. Due to unusually cold winter water (31°F.) in this creek, run timing is of "middle run type", rather than late as in most lake streams. Hatchery water is warmer in mid-winter (36°F. - 37°F.) than creek water, thus selection of late-run donor stocks in 1975 and 1976 was correct.

The wild stock in 1975 was estimated as 4,000 pinks, however, in the absence of stream markers or State enforcement, two vessels caught 3,500 off the delta, leaving but 400 - 500 spawners. In 1976, about 1,200 wild fish appeared, of which 732 were artificially spawned and about 400 spawned in the streambed. Unfortunately, violent floods after September 7 and throughout the winter and spring, completely destroyed the streambed and spawn.

Planning for delta structures which will increase the productivity from natural spawning and will allow gathering and sorting of fish needed for artificial spawning is underway. Diversion of flood waters from these improvements will be necessary. Construction is planned for spring 1978, just prior to arrival of the 1978 adult return.

#### V. Financial Analysis

The State of Alaska, Department of Commerce and Economic Development and other loan agencies have required a high level of bookkeeping and annual independent C.P.A. audits from this corporation. We believe the C.P.A. audit (see attachment #2) for the most recent fiscal year of this corporation provides Alaska Department of Fish & Game with the financial details it is now requesting.

Sea Grant programs at the University of Alaska dealing with the Port San Juan "pilot" project include one on economic feasibility over 20-22 years. Dr. Frank Orth, the project leader, has already provided the Fisheries Council, including the Commissioner of Fish and Game, with these analyses.

#### VI. Discussion and Recommendations

The initial operations of San Juan hatchery, as at any other new plant, will take a reasonable time period to debug, improve and smooth. We hope the Department will agree with our conclusion that the first year went better than one would normally expect. The largest egg take on pinks since 1928 (Washington Department of Fisheries for Puget Sound) was accomplished for this species. With timing of release for 90 percent of the fry perfectly matched to an unusually good zooplankton blooms, above average ocean survivals are very likely to occur. Should the 1978 return be well in excess of the normal (200,000), this corporation will have contributed heavily to the credibility of both private and public enhancement programs.

An inhibiting factor to rapid technological advancement at Port San Juan is the serious lack of communications between the corporation operations staff and that of other agencies such as F. R. E. D., Division and the Canadian Fisheries Service groups working simultaneously on identical species problem. While extensive travel to other installations would solve this problem, the finances of a small, non-profit corporation will not permit this solution. A monthly newsletter by the Department which would pinpoint periodic break-throughs in technology of both private and governmental facilities in Alaska and British Columbia would greatly assist in this problem. Normal publication channels simply are not satisfactory given the present status of rapid change in incubation box design, artificial substrate trials, marking methods, fish handling, etc. Specific

data on returns or failures from the hundreds of experimental programs are especially hard to come by and yet such are desperately needed for construction and operations planning. That most of these data are readily available at F.R.E.D. headquarters does not satisfy the 1974 and 1975 legislative intent of dissemination of the same to individual private aquaculture corporations.

The new State law emanating from HB 264 (1977) sets corporation reporting dates at December 15 each year. This may prove workable but a date encompassing completely each fish operating year (August-June) would be more logical. Thus July 1 or July 15 would have been preferred dates.

New rules issued by the Department regarding 30-day lead time prior to release of fry in the spring are fine in general theory, but fail to take into account two problems with the new deep-matrix-incubator hatcheries. These are that facilities are often so remote as to have no reliable transportation in mid and late winter and that with enormous numbers of fry in the boxes (20 million at San Juan in 1978), early outmigration of some fish is unavoidable. It will be physically impossible to conduct pathological examinations in some years at an early date and holding of fry in freshwater for prolonged periods will not work.

## VII. Research

The small fry marking program of 1977 has already been mentioned and until the 1978 return, results will not be available.

Two other research efforts of significance are underway or planned for 1977. A Sea Grant sponsored estuarine study at Sawmill Bay and adjacent waterways is in its second year. Excellent data on fish distribution, feeding habits, plankton being used or not used was obtained in 1977 in addition to the general oceanographic data. This program will not terminate until fish have disappeared about July 1, thus data are not available at present. The Institute of Marine Science, University of Alaska carries out this program with permanent employees plus graduate students; Prince William Sound Aquaculture Corporation supplies the support facility.

Another research program of 1977 is a joint ADF&G-PWSAC adult tagging during the July-August commercial season. Tagging and recovery will take place not only around the immediate vicinity of Port San Juan hatchery, but also at major fishing locations 10 to 15 miles north, south and east of the hatchery. Project leader is Michael McCurdy, Commercial Fisheries Division, Cordova office.

Remaining activity of the corporation Research and Development program will deal with site surveys at future hatchery sites, miscellaneous contributions to data requirements of the Prince William Sound Joint Regional Planning Team, small scale experimentation with incubation box and component design, and conceptual designing of artificial spawning channels, streamside incubation units and adult handling facilities for the Larsen Creek delta.